UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

January 18, 2001

MEMORANDUM

SUBJECT: ATRAZINE. HED Product and Residue Chemistry Chapters. DP Barcode D272006. PC Code: 080803. Case 0062.

FROM: Catherine Eiden, Branch Senior Scientist
Reregistration Branch 3
Health Effects Division (7509C)
and
David Soderberg, Chemist
Reregistration Branch 3
Health Effects Division (7509c)

TO: Pam Noyes, Special Review Manager
Special Review and Reregistration Division (7508C)

This memorandum contains the HED Product and Residue Chemistry chapters for the atrazine RED. The chapters were assembled by Dynamac Corporation under the supervision of HED. The data assessment has undergone secondary review in the division and has been revised to reflect Agency policies.

The HED Chemistry Science Advisory Committee (Chem SAC) concluded on 10/11/00 (memo dated 10/15/00, C. Eiden, D269608) that finite residues of atrazine and its chloro-metabolites metabolites were not expected in hog tissues, poultry tissues or eggs. Based on this decision, HED is recommending that the existing tolerances for hogs, poultry, and eggs be revoked. HED has also determined that there is no reasonable expectation of finite residues of arazine's hydroxy-metabolites in meat/milk/poultry/eggs. The primary producer of atrazine is no longer supporting uses of atrazine on orchard grasses and orchard grass, hay. HED is recommending that existing tolerances for these raw agricultural commodities be revoked also. HED recommends that existing tolerances be revoked for sugarcane fodder and forage because these are not significant livestock feed items.

The attached Product and Residue Chemistry Chapters were prepared by Dynamac Corporation and was reviewed in Health Effects Division (HED) for completeness, and for conformance to HED Policy.

This Prodcut and Residue Chemistry Chapter has been revised in response to the Phase I 30-Day Error Correction only registrant review.

Attachments: Atrazine Product Chemistry Chapter

cc: RRB3RF; D. Soderberg; S. Knizner; C. Eiden; 7509c;
RRB3; D. Soderberg: CM-2:821D:308-4137

ATRAZINE

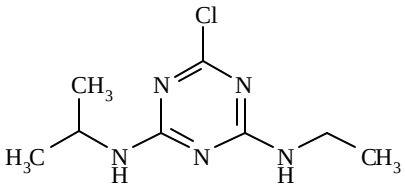
REREGISTRATION ELIGIBILITY DECISION:

PRODUCT CHEMISTRY CONSIDERATIONS

PC Code 080803; Case No. 0062

DESCRIPTION OF CHEMICAL

Atrazine [2-chloro-4-ethylamino-6-isopropylamino-s-triazine] is a triazine herbicide used for the control of annual broadleaf weeds in corn, guavas, macadamia nuts, sorghum, sugarcane, and fallow applications to wheat stubble (fallow programs, only; wheat is not a target crop).



Empirical Formula: $C_8H_{14}ClN_5$
Molecular Weight: 215.7
CAS Registry No.: 1912-24-9
PC Code: 080803

IDENTIFICATION OF ACTIVE INGREDIENT

Atrazine is a white crystalline solid with a melting point of 172-175 C, density of 0.35 g/mL, octanol/water partition coefficient (log P_{ow}) of 2.7645, and vapor pressure of 40 µPa at 20 C. Atrazine is moderately soluble in water (33 ppm at 25 C), and is soluble in octanol (0.82 g/100 mL), ether (0.86 g/100 mL), methanol (1.4 g/100 mL), ethyl acetate (2.5 g/100 mL), and chloroform (7.8 g/100 mL) at 20 C.

MANUFACTURING-USE PRODUCTS

According to a search of the Reference Files System (REFS) conducted 10/27/00, there are seven manufacturing-use products (MPs) registered under PC Code 080803. The registered atrazine MPs subject to a reregistration eligibility decision are presented in Table 1.

Table 1. Registered atrazine manufacturing-use products.

Formulation	EPA Reg. No.	Registrant
97% T	100-529	Novartis Crop Protection, Inc. [1]
97% T	19713-7	Drexel Chemical Company
92.15% T [2]	19713-375	
97% T [2]	34704-784	Platte Chemical Company, Inc.
97% T	35915-6 [3]	Oxon Italia S.P.A.
97.2% T	11603-32	Agan Chem Mfg. Ltd.
95.2% T	67640-1	Sanachem (PTY) Ltd.

[1] Formerly Ciba-Geigy Corporation.
[2] Repackaged from an EPA-registered product.
[3] Transferred 5/23/88 from Ida, Inc. (EPA Reg. No. 45115-63), which was transferred 10/13/87 from Axon Corporation.

REGULATORY BACKGROUND

The Atrazine Reregistration Standard issued 7/25/83 and Guidance Document issued 11/84 required additional product chemistry data concerning atrazine. The Atrazine Second Round Review (SRR) Reregistration Standard dated 10/18/88 required that product chemistry data be resubmitted for the reregistration of atrazine because new requirements had been introduced and previously submitted data needed to be updated. Data submitted in response to the Guidance Document for the technical grade of the active ingredient were evaluated in the SRR with regard to adequacy in fulfilling product chemistry data requirements. The Atrazine Reregistration Standard Update dated 8/11/92 reviewed data submitted in response to the SRR and summarized the available product chemistry database. Of the MPs currently registered, only the Novartis, Drexel, and Oxon Italia 97% Ts were registered at the time of the SRR; the Drexel 92.15% T, Platte 97% T, and Sanachem 95.2% T were all registered subsequent to the issuance of the Atrazine Update.

A Hexachlorobenzene (HCB) and Pentachlorobenzene (PCB) Data Call-In was issued 9/92 for s-triazine active ingredients including atrazine. In addition, analysis for nitrosamines was required for atrazine as a secondary alkylamine. Analysis of one product for dioxins and dibenzofurans was conducted in connection with FIFRA 6(a)(2) requirements.

The current status of the product chemistry data requirements for the atrazine MPs is presented in the attached data summary tables. Refer to these tables for a listing of the outstanding product chemistry data requirements.

CONCLUSIONS

All pertinent product chemistry data requirements are satisfied for the Drexel 97% T/TGAI, except that additional data are required concerning UV/visible absorption (OPPTS 830.7050). Additional data are required for the Novartis 97% T/TGAI concerning certified limits, enforcement analytical method, and UV/visible absorption (OPPTS 830.1750, 1800, and 7050), and for the Oxon Italia 97% T/TGAI concerning enforcement analytical method, stability, oxidation/reduction, explodability, storage stability, corrosion characteristics, and UV/visible absorption (OPPTS 830.1800, 6313, 6314, 6316, 6317, 6320, and 7050). Additional data for the Sanachem 95.2% T are required concerning Group B guidelines, unless the registrant can provide authorization for sharing data. No additional data are required for the Drexel 92.15% T and Platte 97% T because these products are repackaged from EPA-registered products; all product chemistry data requirements will be fulfilled by data for the source products. Provided that the registrants submit the data required in the attached data summary tables for the atrazine T/TGAIs, and either certify that the suppliers of beginning materials and the manufacturing processes have not changed since the last comprehensive product chemistry reviews or submit complete updated product chemistry data packages, the Branch has no objections to the reregistration of atrazine with respect to product chemistry data requirements.

AGENCY MEMORANDA CITED IN THIS DOCUMENT

CBRS No(s).: 1598
Subject: Ciba-Geigy's Response to the Product Chemistry Chapter - Atrazine Registration Standard.
From: G. Makhijani
To: R. Taylor/C. Grubbs and A. Rispin
Dated: 1/16/87
MRID(s): 00142160

CBRS No(s).: Copy of memorandum unavailable
Subject:
From: G. Makhijani
To:
Dated: 9/27/87
MRID(s): 00164821

CBRS No(s).: 7221
Subject: Oxon Italia S.P.A.: Response to the Atrazine Reregistration Standard: Product Chemistry.
From: R. Perfetti
To: R. Engler and L. Rossi
Dated: 3/7/91
MRID(s): 41640401

CBRS No(s).: 7935
DP Barcode(s): D164066
Subject: FIFRA Section 6(a)(2) Submission. Chlorinated Dibenzofuran Impurity in Technical Atrazine. I.D. No. 100-529.
From: S. Funk
To: J. Morrill and M. Copley
Dated: 8/30/91
MRID(s): None

CBRS No(s).: 8710
DP Barcode(s): D169625
Subject: FIFRA Section 6(a)(2) Submission. Chlorinated Dibenzofuran Impurity in Technical Atrazine. Additional Data. I.D. No. 100-529.
From: S. Funk
To: J. Morrill
Dated: 10/31/91
MRID(s): 42043501

CBRS No(s).: 8929
DP Barcode(s): D171379
Subject: FIFRA Section 6(a)(2) Submission. Chlorinated Dibenzofuran Impurity in Technical Atrazine. Method. I.D. No. 100-529.
From: S. Funk
To: J. Morrill
Dated: 11/26/91
MRID(s): None

CBRS No(s).: 9499
DP Barcode(s): D175209
Subject: FIFRA Section 6(a)(2) Submission. Chlorinated Dibenzofuran Impurity in Technical Atrazine. Details of Analytical Method and Results. I.D. No. 100-529.
From: S. Funk
To: J. Morrill
Dated: 4/8/92
MRID(s): 42211401

CBRS No(s).: 9030
DP Barcode(s): D172008
Subject: ID#: 080803. Atrazine Technical: Product Chemistry. Generic Data.
From: W. Anthony
To: V. Eagle
Dated: 4/22/92
MRID(s): 42094801

CBRS No(s).: 10459
DP Barcode(s): D181899
Subject: EPA Reg. No. 35915-6. Nitrosamine analysis of Oxon Italia's Atrazine Technical.
From: K. Dockter
To: W. Waldrop/V. Eagle
Dated: 8/12/92
MRID(s): 42422001

CBRS No(s).: 10328
DP Barcode(s): D181196
Subject: Atrazine. Product Chemistry Data for Guidelines 61-1, 62-1, 62-2, and 62-3. EPA Reg. No. 35915-6
From: M. Metzger
To: W. Waldrop/V. Eagle
Dated: 10/23/92
MRID(s): 42401101

CBRS No(s).: 9872
DP Barcode(s): D178290
Subject: Reregistration of Atrazine. Nitrosamine analysis of Oxon Italia's 98% T; EPA Reg. No. 35915-6.
From: K. Dockter
To: W. Waldrop/V. Eagle
Dated: 12/30/92
MRID(s): 42298801

CBRS No(s).: 10187
DP Barcode(s): D180351
Subject: Reregistration of Atrazine. Nitrosamine analysis of Drexel's 97% T; EPA Reg. No. 19713-7.
From: K. Dockter
To: W. Waldrop/V. Eagle
Dated: 1/5/93
MRID(s): 42369801

CBRS No(s).: 12241
DP Barcode(s): D191012
Subject: Atrazine Reregistration: List A Chemical (Chemical No. 080803; Case No. 0062) Drexel: Response (Correspondence dated 6/15/93) to the Atrazine Reregistration Standard Update (8/11/92) Product Chemistry Data Requirements and Requests a Time Extension to Submit These Data.
From: F. Toghrol
To: L. Rossi/W. Waldrop
Dated: 8/18/93
MRID(s): None

CBRS No(s).: 12087
DP Barcode(s): D192471
Subject: EPA Reg. No. 35915-6. Nitrosamine analysis of Oxon Italia's Atrazine Technical.
From: K. Dockter
To: V. Eagle
Dated: 9/1/93
MRID(s): 42807301

CBRS No(s).: 12930
DP Barcode(s): D197265
Subject: Atrazine Reregistration: List A Chemical (Chemical No. 080803; Case No. 0062) Ciba-Geigy: Response to the Atrazine Reregistration Standard Update Product Chemistry Data Requirements.
From: F. Toghrol
To: L. Rossi/W. Waldrop
Dated: 12/22/93
MRID(s): 43016501

CBRS No(s).: 13538
DP Barcode(s): D201966
Subject: Atrazine Reregistration: List A Chemical No. 080803; Case No. 0062. Ciba-Geigy Response to Atrazine Product Chemistry Data Requirements.
From: F. Toghrol
To: W. Waldrop
Dated: 9/20/94
MRID(s): 43188901 and 43188902

CBRS No(s).: 14022 (Copy of memorandum unavailable)
DP Barcode(s): D205633
Subject:
From: S. Funk
To:
Dated: 9/22/94
MRID(s): 43266101-43266103 and 43272301

CBRS No(s).: 14621
DP Barcode(s): D208583
Subject: Atrazine (List A Chemical 080803, Case 0062). Drexel Chemical Company Response to Review of Product Chemistry and Hexachlorobenzene DCI Submissions.
From: S. Funk
To: W. Waldrop/V. Eagle and R. Dumas/D. Utterback
Dated: 11/1/94
MRID(s): None

CBRS No(s).: 14663
DP Barcode(s): D208990
Subject: Atrazine (List A, Chemical 080803, Case 0062). Drexel Chemical Company Response to Review of Product Chemistry and Hexachlorobenzene DCI Submissions.
From: S. Funk
To: W. Waldrop/V. Eagle and R. Dumas/D. Utterback
Dated: 12/5/94
MRID(s): None

CBRS No(s).: 14612
DP Barcode(s): D208737
Subject: EPA Reg. No. 19713-007. Nitrosamine Analyses of Drexel's Atrazine Technical.
From: K. Dockter
To: W. Waldrop/V. Eagle-Kunst
Dated: 12/16/94
MRID(s): 43405701

CBRS No(s).: 14718
DP Barcode(s): D209427
Subject: Atrazine Reregistration. Oxon Italia Response on Product Chemistry.
From: J. Abbotts
To: V. Eagle-Kunst
Dated: 1/23/95
MRID(s): 43437001

CBRS No(s).: 14287
DP Barcode(s): D206904
Subject: Atrazine Reregistration. Ciba-Geigy Response on Product Chemistry.
From: J. Abbotts
To: V. Eagle-Kunst
Dated: 1/24/95
MRID(s): 43337901

CBRS No(s).: 14756
DP Barcode(s): D209702
Subject: Atrazine (List A, Chemical 080803, Case 0062). Drexel Chemical Company Response to Registration Standard for Product Chemistry (GLNs 63-13, -14, and -16).
From: S. Funk
To: W. Waldrop/V. Eagle
Dated: 1/24/95
MRID(s): 43443601

CBRS No(s).: 14791
DP Barcode(s): D209923
Subject: Atrazine (List A, Chemical 080803, Case 0062). Drexel Chemical Company Response to Special Review Hexachlorobenzene DCI. Response to the Registration Standard for Product Chemistry (GLN 61-2).
From: S. Funk
To: W. Waldrop/V. Eagle and R. Dumas/D. Utterback
Dated: 1/27/95
MRID(s): 43464801

CBRS No(s).: 14893
DP Barcode(s): D210499
Subject: Atrazine (List A, Chemical 080803, Case 0062). Drexel Chemical Company Response to Special Review Hexachlorobenzene DCI.
From: S. Funk
To: W. Waldrop/V. Eagle and R. Dumas/D. Utterback
Dated: 1/27/95
MRID(s): 43457401

CBRS No(s).: 15514
DP Barcode(s): D215052
Subject: Atrazine (List A, Chemical 080803, Case 0062). Drexel Chemical Company Response to Registration Standard for Product Chemistry (GLN's 63-1, 63-13).
From: S. Funk
To: W. Waldrop/V. Eagle
Dated: 4/23/95
MRID(s): 43628601

CBRS No(s).: 15748
DP Barcode(s): D216580
Subject: Product Chemistry for Atrazine Technical. Chemical No. 080803. Case No. 0062. Registration No. 19713-7. GLN's 63-17; 63-20.
From: S. Funk
To: W. Waldrop/V. Eagle
Dated: 7/6/95
MRID(s): 43671701

CBRS No(s).: 15704
DP Barcode(s): D218124
Subject: Product Chemistry for Atrazine Technical. Chemical No. 080803. Case No. 0062. Registration No. 19713-7. GLNs 62-1.
From: S. Funk
To: W. Waldrop/V. Eagle
Dated: 9/7/95
MRID(s): 43742801

CBRS No(s).: 12613
DP Barcode(s): D195429
Subject: Atrazine (Chemical 080803, Case 0062, List A). Product Chemistry. Determination of HCB/PCB in Ciba-Geigy Technical (100-529).
From: S. Funk
To: R. Dumas/D. Utterback
Dated: 10/10/95
MRID(s): 42925201

CBRS No(s).: 16348
DP Barcode(s): D220144
Subject: Product Chemistry for Atrazine Technical. Chemical No. 080803. Case No. 0062. Registration No. 19713-7. GLN's 62-3.
From: S. Funk
To: W. Waldrop/V. Eagle-Kunst
Dated: 11/7/95
MRID(s): 43500901

CBRS No(s).: 16304
DP Barcode(s): D219770
Subject: Product Chemistry for Ciba-Geigy Atrazine. Chemical No. 080803. Case No. 0062. Registration No. 100-529. GLN's 63-13.
From: S. Funk
To: W. Waldrop/V. Eagle-Kunst
Dated: 11/8/95
MRID(s): 43796001

CBRS No(s).: 16726
DP Barcode(s): D222119
Subject: Product Chemistry for Ciba-Geigy Atrazine. Chemical No. 080803. Case No. 0062. Registration No. 100-529. GLN 63-17.
From: S. Funk
To: W. Waldrop/V. Eagle-Kunst
Dated: 1/26/96
MRID(s): 43395501

CBRS No(s).: 14995
DP Barcode(s): D211159
Subject: Product Chemistry for Ciba-Geigy Atrazine. Chemical No. 080803. Case No. 0062. Registration No. 100-529. GLNs 61-1, 62-1, 62-2, and 62-3.
From: S. Funk
To: W. Waldrop/V. Eagle-Kunst
Dated: 2/2/96
MRID(s): 43505801

CBRS No(s).: RD Memorandum
DP Barcode(s): D219859
Subject: Registration Division/Registration Support Branch/Product Chemistry Review Section Transmittal/Product Chemistry Review of a Registration Action for a Technical Grade Active Ingredient; Action Code 165 New Chemical, Food/Feed Uses. Submission S2494972, Reg./File Symbol No. 67640-R, Chemical Name 080803 Atrazine: 2-chloro-4-ethylamino-6-isopropyl-amino-s-triazine, CAS Registry No. 1912-24-9.
From: S. Malak
To: R. Taylor/E. Allen
Dated: 3/1/96
MRID(s): 43754701 and 43782201

CBRS No(s).: RD Memorandum
Subject: Addendum to Review of D219859 from Sanachem for Me-too Registration of Atrazine Technical, EPA Reg. No. 67640-R.
From: H. Podall
To: E. Allen
Dated: 3/29/96
MRID(s): CSF dated 3/20/96

CBRS No(s).: 16520 and 16581
DP Barcode(s): D221089
Subject: Atrazine Reregistration. Ciba 7/29/93 & 9/13/93 Submissions [GLN "830.1700" Data (Nitrosamine Analyses) & CSFs for the Technical; 100-529] in Response to the DCI.
From: K. Dockter
To: P. Deschamp
Dated: 3/28/97
MRID(s): 42873701

CBRS No(s).: RD Memorandum
DP Barcode(s): D254931
Subject: Product Chemistry Review of Technical Grade Active Ingredient; Reg./File Symbol No.: 19713-7; Drexel Atrazine Technical 97% Atrazine; Drexel Chemical Company
From: S. Malak
To: J. Tompkins/W. Allen
Dated: 4/14/99
MRID(s): CSF dated 1/15/99

CBRS No(s).: RD Memorandum
DP Barcode(s): D257511
Subject: Product Chemistry Review; Reg./File Symbol No. 100-529; Technical Atrazine; Novartis Crop Protection, Inc.
From: B. Kitchens
To: J. Tompkins/E. Minor
Dated: 8/31/99
MRID(s): CSF dated 2/2/98

CBRS No(s): RD Memorandum
DP Barcode(s): D259394
Subject: Product Chemistry Review of EP [sic.]; EPA Reg./File Symbol No.: 19713-375; Product Name: Drexel Atrazine Technical II; Drexel Chemical Company
From: S. Mathur
To: J. Tompkins
Dated: 10/14/99
MRID(s): None

DP Barcode(s): TBD
Subject: Product Chemistry Review; EPA Reg. No. 100-529; Technical Atrazine; Novartis Crop Protection, Inc.
From:
To:
Dated: Currently under review
MRID(s): 44488801

PRODUCT CHEMISTRY CITATIONS

Bibliographic citations include only MRIDs containing data which fulfill data requirements.

References (cited):

00022855 Esser, H.O.; DuPuis, G.; Ebert, E.; et al. (1974) s-Triazines. Pages 129-208, in [Without Title]. By ? N.P. (Also in unpublished submission received Oct 7, 1977 under 100-566; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:231969-C)

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43457401 Claussen, F. (1994) Analysis of Seven Lots of Atrazine for Hexachlorobenzene and Pentachlorobenzene: Lab Project Number: 130S11. Unpublished study prepared by EPL Bio-Analytical Services, Inc. 216 p.

43464801 Handy, R. (1994) Sampling Plan: PCB/HCB Data Call-in: Atrazine Technical. Unpublished study prepared by Drexel Chemical Co. 9 p.

43500901 Handy, R. (1994) Analysis and Certification of Product Ingredients: Drexel Atrazine Technical. Unpublished study prepared by Drexel Chemical Company. prepared by Drexel Chemical Company. 33 p.

43505801 Stubbs, D. (1994) Atrazine Technical: Supplement to Product Chemistry: Lab Project Number: PC-94-018: AK-53/2. Unpublished study prepared by Ciba Crop Protection. 71 p.

43628601 Ellison, F. (1995) Physical and Chemical Characteristics of Atrazine Technical: Stability, Oxidizing or Reducing, and Explodability: Amended Final Report: Lab Project Number: 860-04. Unpublished study prepared by Case Consulting Labs, Inc. 57 p.

43671701 Ellison, F. (1995) Storage Stability and Corrosion Characteristics--1 Year at Room Temperature: Atrazine Technical: Amended Final Report: Lab Project Number: 860-02. Unpublished study prepared by Case Consulting Labs, Inc. 51 p.

43742801 Harsy, S. (1995) Analysis of Atrazine for N-Nitrosamines: Final Report: Lab Project Number: 6633-100. Unpublished study prepared by Corning Hazleton, Inc. 79 p.

43754701 Phillips, S. (1995) Appendix I to Volume 1 of the Registration Application Submission for Technical Atrazine: (Product Identity and Composition). Unpublished study prepared by Technical Assessment Systems, Inc. 71 p.

43782201 Noland, P. (1995) Product Chemistry: Technical Atrazine: (Stability): (Final Report): Lab Project Number: PC-95-032: 458-95F. Unpublished study prepared by Ciba-Geigy Corp. 35 p.

43796001 Stubbs, D. (1995) Product Chemistry: Technical Atrazine: (Stability): (Final Report): Lab Project Number: PC-95-032: 458-95F. Unpublished study prepared by Ciba-Geigy Corp. 35 p.

44488801 Lail, L. (1998) Technical Atrazine: Product Chemistry (Preliminary Analysis): Lab Project Number: 206-98: ASR-073: 145-94. Unpublished study prepared by Novartis Crop Protection, Inc. 17 p. {OPPTS 830.1700}

Case No. 0062
PC Code 080803

Case Name: Atrazine
Registrant: Novartis Crop Protection
Product(s): 97% T (EPA Reg. No. 100-529)

PRODUCT CHEMISTRY DATA SUMMARY

Guideline Number	Requirement	Are Data Requirements Fulfilled? [1]	MRID Number [2]
830.1550	Product identity and composition	Y	**40566501**, 43188901 [3], 43505801 [4], CSF 2/2/98 [5]
830.1600	Description of materials used to produce the product	Y	**40566501**
830.1620	Description of production process	Y	**40566501**
830.1670	Discussion of formation of impurities	Y	00142160 [6], Letter 4/19/91 [7], 42043501 [8], 43188901 [3]
830.1700	Preliminary analysis	Y	00142160 [6], 00164821 [9], Letter 4/19/91 [7], 42043501 [8], Letter 11/8/91 [10], 42211401 [11], 42873701 [12], 42925201 [13], 44488801 [14]
830.1750	Certified limits	N [15]	**40566501**, 42925201 [13], 43188901 [3], CSF 9/1/93 [12], CSF 2/2/98 [5]
830.1800	Enforcement analytical method	Y [16]	00142160 [6], 00164821 [9], 42873701 [12]
830.6302	Color	Y	**00142160**
830.6303	Physical state	Y	**00142160**
830.6304	Odor	Y	**00142160**
830.6313	Stability to normal and elevated temperatures, metals, and metal ions	Y	**00023497**, **00023548**, **00023963**, 43337901 [17], 43796001 [18]
830.6314	Oxidation/reduction: chemical incompatability	Y	43016501 [19], 43188902 [3]
830.6315	Flammability	N/A [20]	
830.6316	Explodability	Y	43016501 [19], 43188902 [3]
830.6317	Storage stability	Y	**00023548**, 43395501 [21]
830.6319	Miscibility	N/A [20]	
830.6320	Corrosion characteristics	Y	**00142160**, 43016501 [19], 43188902 [3]
830.7000	pH	Y	**00142160**, 43337901 [17]
830.7050	UV/visible absorption	N [22]	
830.7100	Viscosity	N/A [20]	
830.7200	Melting point/melting range	Y	00142160 [6], **00164822**
830.7220	Boiling point/boiling range	N/A [20]	
830.7300	Density/relative density/bulk density	Y	**00023548**, 43016501 [19], 43188902 [3]
830.7370	Dissociation constants in water	Y	**00022855**
830.7550	Partition coefficient (n-octanol/water), shake flask method	Y	00142160 [6], 00164822, 43337901 [17]

Guideline Number	Requirement	Are Data Requirements Fulfilled? [1]	MRID Number [2]
830.7840	Water solubility: column elution method; shake flask method	Y	**00023497**, 43337901 [17]
830.7950	Vapor pressure	Y	00142160 [6], **00164822**

[1] Y = Yes; N = No; N/A = Not Applicable.

[2] **Bolded** references were reviewed in the Atrazine SRR dated 10/18/88; and all other references were reviewed as noted.

[3] CBRS No. 13538, D201966, 9/20/94, F. Toghrol.

[4] CBRS No. 14995, D211159, 2/2/96, S. Funk.

[5] RD Memorandum, D257511, 8/31/99, B. Kitchens

[6] CBRS No. 1598, 1/16/87, G. Makhijani.

[7] CBRS No. 7935, D164066, 8/30/91, S. Funk.

[8] CBRS No. 8710, D169625, 10/31/91, S. Funk.

[9] CBRS Memorandum, 1/27/87, G. Makhijani.

[10] CBRS No. 8929, D171379, 11/26/91, S. Funk.

[11] CBRS No. 9499, D175209, 4/8/92, S. Funk.

[12] CBRS Nos. 16520 and 16581, D221089, 3/28/97, K. Dockter.

[13] CBRS No. 12613, D195429, 10/10/95, S. Funk.

[14] DXXXXXX, currently under review.

[15] The CSF must be revised to include upper certified limits for HCB/PCBs; CBRS No. 12613, D195429, 10/10/95, S. Funk.

[16] Previously an enforcement analytical method was required for a new impurity identified on the revised CSF (CBRS No. 13538, D201966, 9/20/94, F. Toghrol). This impurity has been identified as cyanazine that was listed to cover cross-contamination at the manufacturing plant. Since cyanazine is no longer being produced, concerns about cross-contamination and cyanazine as an impurity can be dropped. The requirement for an enforcement analytical method for the "new impurity" is no longer warranted.

[17] CBRS No. 14287, D206904, 1/24/95, J. Abbotts.

[18] CBRS No. 16304, D219770, 11/8/95, S. Funk.

[19] CBRS No. 12930, D197265, 12/22/93, F. Toghrol.

[20] Data are not required because the TGAI/MP is a solid at room temperature.

[21] CBRS No. 16726, D222119, 1/26/96, S. Funk.

[22] The OPPTS Series 830, Product Properties Test Guidelines require data pertaining to UV/visible absorption for the PAI.
Case No. 0062
PC Code 080803

Case Name: Atrazine
Registrant: Drexel Chemical Company
Product(s): 97% T (EPA Reg. No. 19713-7)

PRODUCT CHEMISTRY DATA SUMMARY

Guideline Number	Requirement	Are Data Requirements Fulfilled? [1]	MRID Number [2]
830.1550	Product identity and composition	Y	**41379801**, Letter 6/15/93 [3], CSF 10/21/94 [4]
830.1600	Description of materials used to produce the product	Y	00124099, **41379801**, 43266101 [5]
830.1620	Description of production process	Y	00124099, **41379801**, 43266101 [5]
830.1670	Discussion of formation of impurities	Y	00124099, **41379801**
830.1700	Preliminary analysis	Y	00125334, **41379802**, 42369801 [6], No MRID # [7], 43405701 [8], 43457401 [4], 43464801 [9], 43742801 [10]
830.1750	Certified limits	Y	**41379802**, Letter 6/15/93 [3], 43266102, CSF 10/21/94 [4]
830.1800	Enforcement analytical method	Y	00124099, **41379801**, 43266102 [5], 43500901 [11]
830.6302	Color	Y	**41379803**
830.6303	Physical state	Y	**41379803**
830.6304	Odor	Y	**41379803**
830.6313	Stability to normal and elevated temperatures, metals, and metal ions	Y	**41379803**, 43443601 [12], 43628601 [13]
830.6314	Oxidation/reduction: chemical incompatability	Y	43443601 [13]
830.6315	Flammability	N/A [14]	
830.6316	Explodability	Y	43266103 [5], 43443601 [12]
830.6317	Storage stability	Y	43272301 [5], 43671701 [15]
830.6319	Miscibility	N/A [14]	
830.6320	Corrosion characteristics	Y	00149931, 43272301 [5], 43671701 [15]
830.7000	pH	Y	00149931, **41379803**, 43266103 [5]
830.7050	UV/Visible absorption	N [16]	
830.7100	Viscosity	N/A [14]	
830.7200	Melting point/melting range	Y	**41379803**
830.7220	Boiling point/boiling range	N/A [14]	
830.7300	Density/relative density/bulk density	Y	**41379803**
830.7370	Dissociation constants in water	Y	**41379803**
830.7550	Partition coefficient (n-octanol/water), shake flask method	Y	00149931, **41379803**
830.7840	Water solubility: column elution method; shake flask method	Y	**41379803**
830.7950	Vapor pressure	Y	**41379803**

[1] Y = Yes; N = No; N/A = Not Applicable.

[2] **Bolded** references were reviewed in the Atrazine Update dated 8/11/92; underlined references were reviewed in the Atrazine SRR Reregistration Standard dated 10/18/88; and all other references were reviewed as noted.

[3] CBRS No. 12241, D191012, 8/18/93, F. Toghrol.

[4] CBRS No. 14893, D210499, 1/27/95, S. Funk.

[5] CBRS No. 14022, D205633, 9/22/94, S. Funk.

[6] CBRS No. 10187, D180351, 1/5/93, K. Dockter.

[7] CBRS No. 14621, D208583, 11/1/94, S. Funk; and CBRS No. 14663, D208990, 12/5/94, S. Funk.

[8] CBRS No. 14612, D208737, 12/16/94, K. Dockter.

[9] CBRS No. 14791, D209923, 1/27/95, S. Funk.

[10] CBRS No. 15704, D218124, 9/7/95, S. Funk.

[11] CBRS No. 16348, D220144, 11/7/95, S. Funk.

[12] CBRS No. 14756, D209702, 1/24/95, S. Funk.

[13] CBRS No. 15514, D215052, 4/23/95, S. Funk.

[14] Data are not required because the TGAI/MP is a solid at room temperature.

[15] CBRS No. 15748, D216580, 7/6/95, S. Funk.

[16] The OPPTS Series 830, Product Properties Test Guidelines require data pertaining to UV/visible absorption for the PAI.

Case No. 0062
PC Code 080803

Case Name: Atrazine
Registrant: Drexel Chemical Company
Product(s): 92.15% T (EPA Reg. No. 19713-375)

PRODUCT CHEMISTRY DATA SUMMARY

Guideline Number	Requirement	Are Data Requirements Fulfilled? [1]	MRID Number [2]
830.1550	Product identity and composition	Y	CSF 2/8/93
830.1600	Description of materials used to produce the product	N/A	
830.1620	Description of production process	N/A	
830.1670	Discussion of formation of impurities	N/A	
830.1700	Preliminary analysis	N/A	
830.1750	Certified limits	Y	CSF 2/8/93
830.1800	Enforcement analytical method	N/A	
830.6302	Color	N/A	
830.6303	Physical state	N/A	
830.6304	Odor	N/A	
830.6313	Stability to normal and elevated temperatures, metals, and metal ions	N/A	
830.6314	Oxidation/reduction: chemical incompatability	N/A	
830.6315	Flammability	N/A	
830.6316	Explodability	N/A	
830.6317	Storage stability	N/A	
830.6319	Miscibility	N/A	
830.6320	Corrosion characteristics	N/A	
830.7000	pH	N/A	
830.7050	UV/Visible absorption	N/A	
830.7100	Viscosity	N/A	
830.7200	Melting point/melting range	N/A	
830.7220	Boiling point/boiling range	N/A	
830.7300	Density/relative density/bulk density	N/A	
830.7370	Dissociation constants in water	N/A	
830.7550	Partition coefficient (n-octanol/water), shake flask method	N/A	
830.7840	Water solubility: column elution method; shake flask method	N/A	
830.7950	Vapor pressure	N/A	

[1] Y = Yes; N = No; N/A = Not Applicable. The CSF dated 2/8/93 for the basic formulation indicates that this product is repackaged from an EPA-registered product; all data requirements will be fulfilled by data for the source product. We note that a CSF dated 7/22/99 for an alternate formulation was approved by RD (D259394, 10/14/99, S. Mathur).

[2] The CSF dated 2/8/93 was obtained from the product jacket.

Case No. 0062
PC Code 080803

Case Name: Atrazine
Registrant: Platte Chemical Company, Inc.
Product(s): 97% T (EPA Reg. No. 34704-784)

PRODUCT CHEMISTRY DATA SUMMARY

Guideline Number	Requirement	Are Data Requirements Fulfilled? [1]	MRID Number [2]
830.1550	Product identity and composition	Y	CSF 9/12/96
830.1600	Description of materials used to produce the product	N/A	
830.1620	Description of production process	N/A	
830.1670	Discussion of formation of impurities	N/A	
830.1700	Preliminary analysis	N/A	
830.1750	Certified limits	Y	CSF 9/12/96
830.1800	Enforcement analytical method	N/A	
830.6302	Color	N/A	
830.6303	Physical state	N/A	
830.6304	Odor	N/A	
830.6313	Stability to normal and elevated temperatures, metals, and metal ions	N/A	
830.6314	Oxidation/reduction: chemical incompatability	N/A	
830.6315	Flammability	N/A	
830.6316	Explodability	N/A	
830.6317	Storage stability	N/A	
830.6319	Miscibility	N/A	
830.6320	Corrosion characteristics	N/A	
830.7000	pH	N/A	
830.7050	UV/Visible absorption	N/A	
830.7100	Viscosity	N/A	
830.7200	Melting point/melting range	N/A	
830.7220	Boiling point/boiling range	N/A	
830.7300	Density/relative density/bulk density	N/A	
830.7370	Dissociation constants in water	N/A	
830.7550	Partition coefficient (n-octanol/water), shake flask method	N/A	
830.7840	Water solubility: column elution method; shake flask method	N/A	
830.7950	Vapor pressure	N/A	

[1] Y = Yes; N = No; N/A = Not Applicable. The CSF indicates that this product is repackaged from an EPA-registered product; all data requirements will be fulfilled by data for the source product.

[2] The CSF dated 9/12/96 was obtained from the product jacket.

Case No. 0062
PC Code 080803

Case Name: Atrazine
Registrant: Oxon Italia S.P.A.
Product(s): 97% T (EPA Reg. No. 35915-6)

PRODUCT CHEMISTRY DATA SUMMARY

Guideline Number	Requirement	Are Data Requirements Fulfilled? [1]	MRID Number [2]
830.1550	Product identity and composition	Y	42094801 [3], CSF 7/14/92 [4]
830.1600	Description of materials used to produce the product	Y	**41640401**
830.1620	Description of production process	Y	**41640401**
830.1670	Discussion of formation of impurities	Y	**41640401**, 42094801 [3]
830.1700	Preliminary analysis	Y	**41640401**, 42094801 [3], 42298801 [5], 42401101 [4], 42422001 [6], 42807301 [7]
830.1750	Certified limits	Y	**41640401**, 42094801 [3], CSF 7/14/92 [4]
830.1800	Enforcement analytical method	N [8]	**41640401**, 42094801 [3], 42401101 [4]
830.6302	Color	Y	43437001 [9]
830.6303	Physical state	Y	43437001 [9]
830.6304	Odor	Y	43437001 [9]
830.6313	Stability to normal and elevated temperatures, metals, and metal ions	N [10]	43437001 [9]
830.6314	Oxidation/reduction: chemical incompatability	N	
830.6315	Flammability	N/A [11]	
830.6316	Explodability	N	
830.6317	Storage stability	N	
830.6319	Miscibility	N/A [11]	
830.6320	Corrosion characteristics	N	
830.7000	pH	Y	43437001 [9]
830.7050	UV/Visible absorption	N [12]	
830.7100	Viscosity	N/A [11]	
830.7200	Melting point/melting range	Y	43437001 [9]
830.7220	Boiling point/boiling range	N/A [11]	
830.7300	Density/relative density/bulk density	Y	43437001 [9]
830.7370	Dissociation constants in water	Y	43437001 [9]
830.7550	Partition coefficient (n-octanol/water), shake flask method	Y	43437001 [9]
830.7840	Water solubility: column elution method; shake flask method	Y [13]	
830.7950	Vapor pressure	Y [13]	

[1] Y = Yes; N = No; N/A = Not Applicable.

[2] **Bolded** references were reviewed under CBRS No. 7221, 3/7/91, R. Perfetti; and all other references were reviewed as noted.

[3] CBRS No. 9030, D172008, 4/22/92, W. Anthony.

[4] CBRS No. 10328, D181196, 10/23/92, M. Metzger.

[5] CBRS No. 9872, D178290, 12/30/92, K. Dockter.

[6] CBRS No. 10459, D181899, 8/12/92, K. Dockter.

[7] CBRS No. 12087, D192471, 9/1/93, K. Dockter.

[8] An enforcement analytical method must be submitted for triazine compounds related to atrazine which is capable of differentiating between the related compounds, and enforcement analytical methods with supporting validation data are required for all impurities related to the active ingredient and present at $0.1%.

[9] CBRS No. 14718, D209427, 1/23/95, J. Abbotts.

[10] Additional data are required concerning the stability of the TGAI at normal temperatures, and upon exposure to metals and metal ions.

[11] Data are not required because the TGAI/MP is a solid at room temperature.

[12] The OPPTS Series 830, Product Properties Test Guidelines require data pertaining to UV/visible absorption for the PAI.

[13] According to the Atrazine SRR Reregistration Standard dated 10/18/88, this PAI data requirement has been fulfilled.

Case No. 0062
PC Code 080803

Case Name: Atrazine
Registrant: Agan Chem Mfg., Ltd.
Product(s): 97.2% T (EPA Reg. No. 11603-32)

PRODUCT CHEMISTRY DATA SUMMARY

Guideline Number	Requirement	Are Data Requirements Fulfilled? [1]	MRID Number [2]
830.1550	Product identity and composition	Y	CSF 10/30/99
830.1600	Description of materials used to produce the product	Y	44961101
830.1620	Description of production process	Y	44961101
830.1670	Discussion of formation of impurities	Y	44961101
830.1700	Preliminary analysis	Y	44961102
830.1750	Certified limits	Y	CSF 10/30/99
830.1800	Enforcement analytical method	Y	44961102
830.6302	Color	Y	44961103
830.6303	Physical state	Y	44961104
830.6304	Odor	Y	44961105
830.6313	Stability to normal and elevated temperatures, metals, and metal ions	Y	44967601
830.6314	Oxidation/reduction: chemical incompatability	Y	44961110
830.6315	Flammability	N/A	
830.6316	Explodability	N/A	
830.6317	Storage stability	Y	44961111
830.6319	Miscibility	N/A	
830.6320	Corrosion characteristics	Y	44961112
830.7000	pH	Y	44961109
830.7050	UV/visible absorption	N/A	
830.7100	Viscosity	N/A	
830.7200	Melting point/melting range	Y	44961106
830.7220	Boiling point/boiling range	N/A	
830.7300	Density/relative density/bulk density	Y	44961107
830.7370	Dissociation constants in water	N/A	
830.7550	Partition coefficient (n-octanol/water), shake flask method	N/A	
830.7840	Water solubility: column elution method; shake flask method	Y	44961108
830.7950	Vapor pressure	N/A	

[1] Y = Yes; N = No; N/A = Not Applicable.

[2] **Bolded** references were reviewed in the Atrazine SRR dated 10/18/88; and all other references were reviewed as noted.

[2] All references were reviewed by the Registration Division (RD).

Case No. 0062
PC Code 080803

Case Name: Atrazine
Registrant: Sanachem (PTY) Ltd.
Product(s): 95.2% T (EPA Reg. No. 67640-1)

PRODUCT CHEMISTRY DATA SUMMARY

Guideline Number	Requirement	Are Data Requirements Fulfilled? [1]	MRID Number
830.1550	Product identity and composition	Y	43754701 [3], Letter 3/20/96 [4],CSF 3/25/96 [4]
830.1600	Description of materials used to produce the product	Y	43754701 [3]
830.1620	Description of production process	Y	43754701 [3]
830.1670	Discussion of formation of impurities	Y	43754701 [3]
830.1700	Preliminary analysis	Y	43782201 [3]
830.1750	Certified limits	Y	43782201 [3], Letter 3/20/96 [4], CSF 3/25/96 [4]
830.1800	Enforcement analytical method	Y	43782201 [3]
830.6302	Color	N	
830.6303	Physical state	N	
830.6304	Odor	N	
830.6313	Stability to normal and elevated temperatures, metals, and metal ions	N	
830.6314	Oxidation/reduction: chemical incompatability	N	
830.6315	Flammability	N	
830.6316	Explodability	N	
830.6317	Storage stability	N	
830.6319	Miscibility	N	
830.6320	Corrosion characteristics	N	
830.7000	pH	N	
830.7050	UV/Visible absorption	N	
830.7100	Viscosity	N	
830.7200	Melting point/melting range	N	
830.7220	Boiling point/boiling range	N	
830.7300	Density/relative density/bulk density	N	
830.7370	Dissociation constants in water	N	
830.7550	Partition coefficient (n-octanol/water), shake flask method	N	
830.7840	Water solubility: column elution method; shake flask method	N	
830.7950	Vapor pressure	N	

[1] Y = Yes; N = No; N/A = Not Applicable. On review of the 3/25/96 CSF for Me-Too registration of the Sanachem 95% T, RD determined (No. DP Barcode, 3/29/96, H. Paddle) that the product is comparable to the Novartis 97% T (EPA Reg. No. 100-529) and the Drexel 97% T (EPA Reg. No. 19713-7). It was noted in the RD review that the cite-all form submitted with the application was not accompanied by the necessary authorization from Ciba-Geigy

(Novartis). Unless authorization to share data from Novartis is received, Sanachem must provide data concerning the physical/chemical properties of the technical product.

[2] All references were reviewed by the Registration Division (RD) in support of Me-Too registration.

[3] RD Memorandum, D219859, 3/1/96, S. Malak.

[4] RD Memorandum dated 3/29/96, H. Paddle.

Atrazine

REREGISTRATION ELIGIBILITY DECISION

RESIDUE CHEMISTRY CONSIDERATIONS

PC Code 080803; Case 0062

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REREGISTRATION ELIGIBILITY DECISION

RESIDUE CHEMISTRY CONSIDERATIONS

PC Code 080803; Case 0062

INTRODUCTION

Atrazine (2-chloro-4-ethylamino-6-isopropylamino-*s*-triazine) is a triazine herbicide registered in the United States by Novartis Crop Protection, Inc. under the trade names Aatrex® and Bicep® for the control of annual broadleaf weeds in corn (field and sweet), guavas, macadamia nuts, sorghum, sugarcane, range grasses, and fallow applications to wheat stubble (fallow programs, only; wheat is not a target crop). Atrazine formulations registered to Novartis for use on food/feed crops include flowable concentrate (FlC) and water dispersable granular (dry flowable, DF) formulations. These products may be applied as a broadcast or banded preemergence, preplant, or early postemergence application using either ground or aerial equipment.

REGULATORY BACKGROUND

Atrazine is a List A chemical and was the subject of a Residue Chemistry Chapter dated 7/25/83, a Guidance Document dated 9/85, and a Second Round Review (SRR) Residue Chemistry Chapter dated 10/18/88. The Agency subsequently issued a Data Call-In (DCI), received by the Registrant in 10/90, which superseded the residue chemistry requirements of all previous DCIs and any other agreements entered into with the Agency pertaining to such requirements. These documents summarized regulatory conclusions on the available residue chemistry data and specified that additional data were required for reregistration purposes. In addition, a Special Review was initiated of the triazine herbicides, including atrazine *(59 FR 60412, 11/23/94, PD1*). Several submissions of data have been received since the Atrazine SRR was issued. The information contained in this document outlines the current Residue Chemistry Science Assessments with respect to the reregistration of atrazine.

Tolerances for residues of atrazine *per se* in/on plant raw agricultural commodities (RACs) have been established under 40 CFR §180.220(a)(1) and range from 0.05 ppm in/on guavas to 15 ppm in/on forage and fodder of corn and sorghum and perennial ryegrass. Tolerances for residues of atrazine *per se* in livestock and poultry commodities have also been established under 40 CFR §180.220(a)(1) at 0.02 ppm (N). Tolerances have also been established under 40 CFR 180.220(a)(2) for residues in/on range grass (4 ppm), orchardgrass, and orchardgrass hay (15 ppm each), expressed in terms of atrazine and its chloro-metabolites, 2-amino-4-chloro-6-ethylamino-*s*-triazine (G-28279), 2-amino-4-

chloro-6-isopropylamino-*s*-triazine (G-30030), and 2-amino-4,6-diamino-*s*-triazine (G-28273). There are currently no tolerances established for atrazine residues in processed food/feed commodities.

Based on a review of avaialable metabolism, residue, and toxicity data, the HED Metabolism Assessment Review Committee (HED MARC) has determined that the atrazine residues of concern are: 1) atrazine and chloro-metabolites; and, 2) the hydroxy metabolites of atrazine (memoranda: C. Eiden, 10/05/00, D269513 & C. Eiden to C. Olinger, 11/15/00). Separate toxicity endpoints have been identified for each of these sets of residues for the purposes of dietary exposure assessment. The residues to be regulated by established tolerances in plant commodities are atrazine and its chloro-metabolites: G-30033, G-28279, and G27283. The residues to be regulated by established tolerances in animal commodities are atrazine and its chloro-metabolites: G-30033, G-28279, and G28273. The HED MARC has also determined that tolerances must be established for residues of the hydroxy atrazine metabolites: G-34048, GS-17794, GS-17792, and GS-17791 (C. Eiden to C. Olinger, 11/15/00).

The chemical names and structures of atrazine and its metabolites are depicted in Figure A.

SUMMARY OF SCIENCE FINDINGS

OPPTS GLN 860.1200: Directions for Use

A search of the Agency's Reference Files System (REFS) on 9/21/00 indicates that there are eight atrazine end-use products (EPs) with feed/food uses registered to Novartis Crop Protection, Inc., three single active ingredient products and 6 MAIs. These EPs are presented below. The registrant voluntarily cancelled AAtrex Accupak Herbicide (100-756) on 8/25/00.

Table 1. End-Use Products with Food/Feed Uses Registered to Novartis Crop Protection, Inc.

EPA Reg No.	Label Acceptance Date	Formulation Class	Product Name
100-497 [a]	8/98	4 lb/gal FlC	AAtrex® 4L Herbicide
100-585 [b]	8/98	90% DF	AAtrex Nine-0® Herbicide
100-817 [c]	4/99	3.1 lb/gal FlC	Bicep II MAGNUM® Herbicide
100-827 [d]	5/99	2.67 lb/gal FlC	Bicep Lite II MAGNUM® Herbicide
100-886 [e]	2/98	3.1lb/gal FlC	Bicep MAGNUM® Herbicide
100-928 [f]	11/98	2.0 lb/gal FlC	Bicep MAGNUM TR® Herbicide

[a] Includes SLN Nos. FL 80002400; IA970001; KS980003; MN0000040; OK830003; OK930004; OK830029; OK910003; OK920007; and TX920005.

[b] Includes SLN Nos. ID830009; OK830003; OK910001; OK920008; OK910001; OK930005; OR790077; OR8000100; TX920006; VT80008; WA790078; WA800083.

[c] A MAI that also includes *S*-metolachlor (2.4 lb/gal FlC) in addition to 3.1lb/gal of atrazine.

[d] A MAI that also includes *S*-metolachlor (3.33 lb/gal FlC) in addition to 2.67 lb/gal of atrazine.

[e] A MAI that also includes CGA-77102 (2.4 lb/gal FlC) in addition to 3.1 lb/gal of atrazine.

[f] A MAI that also includes *S*-metolachlor (2.5 lb/gal FlC) and flumetsulam (0.09 lb/gal FlC) in addition to 2.0 lb/gal of atrazine.

The following label amendments are required:

Use directions for macadamia nuts state that applications may be repeated as necessary. The statement should be replaced to indicate the maximum seasonal rate and a minimum retreatment interval.

The prohibition against the grazing of treated corn crops should be deleted from the labels. Current Agency policy does not allow the prohibition against the use of significant livestock feed items, such as corn forage. The labels should be amended to include a pregrazing/preharvest interval (PGI/PHI) for corn forage; the available residue data would support a 30-day PGI/PHI for corn forage.

Currently, there are four active products listed in REFs with labelled uses on pasture land and rangeland on terrestrial feed items (forages and fodder) or for road side (right-of-way) uses. Valent Atrazine 90DF (59639-106), Riverside Atrazine 90 DF (9779-253), and Oxon Italia 5 L (35915-5) are labelled for application to roadsides at 2 pints and acre, and allow application to Conservation Reserve Program (CRP) land in NE, OR, OK, and TX at 2.2 lbs product/A. Drexel Atrazine 4L (19713-11) is labelled for roadside uses, only. Both of these use patterns include prohibitions against grazing or cutting for hay.

A comprehensive summary of the registered use patterns of atrazine, based on the product labels registered to Novartis, is presented in Table A. A tabular summary of the residue chemistry science assessments for reregistration of atrazine is presented in Table B. The conclusions listed in Table B regarding the reregistration eligibility of atrazine food/feed uses are based on the use patterns registered by the basic producer, Novartis Crop Protection, Inc. When end-use product DCIs are developed (e.g., at issuance of the RED), RD should require that all end-use product labels (e.g., MAI labels, SLNs, and products subject to the generic data exemption) be amended such that they are consistent with the basic producer's labels.

OPPTS GLN 860.1300: Nature of the Residue in Plants

The nature of atrazine residues in plants is adequately understood. Adequate studies are available depicting the metabolism of [^{14}C]atrazine in corn, sorghum, and sugarcane. Although the quantities of individual metabolites vary, the data indicate that the metabolic pathway is similar among the crops tested. Atrazine undergoes extensive metabolism in plants including: N-dealkylation to form the chlorometabolites, G-30033, G-28279 and G-28273; hydroxylation of the parent or chlorometabolites to form G-34048, GS-17792, and GS-17791, and G-17794; and glutathione conjugation by displacement of the 2-chloro moiety. Rearrangement and dealkylation of thio-conjugates or amination of parent or G-30033 to form CGA-101248. Lanthionine, lanthionine sulfoxide, and glutamine conjugates of triazine metabolites also comprise minor portions of the residue in plants. All identified

and characterized residues contain an intact triazine ring. A summary of each of the acceptable metabolism studies is presented below.

In **corn** treated early postemergence with [^{14}C]atrazine at 3 lbs ai/A (1.5x the current maximum post-emergence rate of 2 lbs ai/A) in three locations (MS, IL, NY), TRR were 0.466-2.84 ppm in forage 30 days after treatment (DAT), 0.499-0.710 ppm in silage-stage forage (46-75 DAT), and 0.850-1.809 ppm and 0.034-0.071 ppm in stover and grain, respectively (85-106 DAT). The parent compound and chloro-metabolites each accounted for #2% TRR in each matrix, with the exception of 30-day forage from the NY location containing 43% TRR (1.23 ppm) as parent. Aside from the forage sample with the high percentage of parent, the hydroxy metabolite GS-17794 was the major residue in forage, silage-stage forage, and stover, accounting for 14.4-19.9% TRR. GS-17794 was also the most abundant residue in grain, accounting for 2.7-10.7% TRR. Other hydroxy-metabolites each accounted for #9.1% TRR. Total hydroxy-metabolites accounted for 13.6-36% TRR in 30-day forage and silage stage forage (0.1-0.63 ppm), 18-25% TRR in stover (0.3-1.35 ppm), and 3.9-13.1% TRR in grain (0.004-0.06 ppm). Identified residues accounted for 19.3-57.5% TRR in all forage, silage and stover samples and 3.9-13.1% TRR in grain. Subsequent work also demonstrated the presence of amino-metabolites GS-101428 (1% TRR, 0.015 ppm) and GS-12517 (4.2% TRR, 0.065 ppm) in corn stover.

A recent **corn** metabolism study reflected a single preemergence application of [^{14}C]atrazine at 2 lb ai/A (1x the maximum preemergence rate, 0.8x the maximum seasonal rate). TRR were considerably lower than from the previous postemergence study, ranging from 0.029 ppm in grain to 0.053 ppm in stover. The parent compound accounted for 3.1% TRR (0.001 ppm) in forage (60 DAT) and 0.3 and 0.2 % TRR in silage (90 DAT) and stover (131 DAT); atrazine *per se* was not detected in grain. The identified chloro-metabolites were minor components, each accounting for #3.6% TRR (#0.001 ppm). As in the previous study, the hydroxy-metabolite G-17794 was the most abundant metabolite at 13-19% TRR (0.004-0.01 ppm) in forage, silage, and stover, and 1.5% TRR in grain (0.0004 ppm). The hydroxy-metabolites GS-34048, GS-17792, GS-17791 were minor residue components (#4% TRR) in all corn matrices. Total hydroxy-metabolites accounted for 19-23% TRR (0.006-0.012 ppm) in forage, silage, and stover, and 2.2% TRR in grain (0.0005 ppm). Aqueous-soluble conjugates accounted for 19 and 21% TRR in forage and silage, respectively (0.006 ppm).

In **sorghum** treated early postemergence with [^{14}C]atrazine at 3 lb ai/A (1.5x the current maximum post-emergence rate of 2 lbs ai/A) in MS, IL, and NY, TRR were 0.875-5.351 ppm in forage (30 DAT), 0.277-1.234 ppm in silage-stage forage (46-75 DAT), and 0.418-1.043 ppm and 0.033-0.392 ppm in stover and grain, respectively (85-106 DAT). The parent compound and chloro-metabolites each accounted for #5.8% TRR in each matrix, with the exception of forage from the NY location containing 50% TRR (2.65 ppm) as parent. The hydroxy-metabolites were each minor residue components (#7.8% TRR) in all matrices, and total hydroxy-metabolites accounted for #10% TRR. Aminex A-4 chromatography of the residue produced a peak (Peak 7) containing several components, one of which was identified as the lanthionine conjugate of atrazine. Peak 7 was also identified in forage as accounting for #11.3% TRR. Identified residues accounted for 2-14% TRR, with the exception of one forage sample, from which 54% was identified (50% as parent).

In subsequent analyses, residues in one stover sample were extracted by autoclaving in HCl for 24 hours; additional amounts of the hydroxy-metabolites were released, particularly G-34048 accounting for 37.5% TRR, and cyanuric acid was detected at 17.5% TRR; the total of hydroxy-metabolites and cyanuric acid released was 65.8% TRR. In addition, Aminex-A4 Peak 7 was isolated and further purified, yielding components identified as lanthionine, lanthionine sulfoxide, and glutamine conjugates of atrazine (4, 1, and 0.5% TRR, respectively).

A recent **sorghum** metabolism study reflected a single preemergence application of [^{14}C]atrazine at 2 lb ai/A (1x the maximum preemergence rate, 0.8x the maximum seasonal rate). TRR were considerably lower than from the previous postemergence study, ranging from 0.024 ppm in stover to 0.061 ppm in forage. The parent compound accounted for 1.3% TRR (<0.001 ppm) in forage (44 DAT) and 2.3% TRR in silage (60 DAT) and 0.1% TRR in stover (131 DAT); atrazine *per se* was not detected in grain. The three chloro-metabolites identified in the previous study were minor components, each accounting for #3% TRR. Total hydroxy-metabolites accounted for 1.1-4.6% TRR (#0.011 ppm) in sorghum commodities. Aqueous-soluble putative conjugates accounted for 12, 11, and 15% TRR in forage, silage, and stover, respectively (0.004-0.007 ppm).

A metabolism study was conducted with **sugarcane** reflecting four postemergence applications of [^{14}C]atrazine totaling 10 lb ai/A (1x); the final application was made near lay-by 137 days before final harvest. TRR were 68.99 ppm in /on leaves harvested prior to the fourth application. TRR in leaves and cane at final harvest were 24.22 and 2.09 ppm respectively. Atrazine and its chloro-metabolites each accounted for 0.3-3.0% TRR in final harvest cane (0.007-0.063 ppm); total chlorotriazines accounted for 5.1% TRR (0.108 ppm). The most abundant metabolite in cane was G-17794, accounting for 10% TRR; total hydroxy-metabolites accounted for 14.2% TRR (0.297 ppm). The amino-metabolites GS-12517 and CGA-101248, respectively, comprised 6.5 and 2 % TRR (0.136 and 0.042 ppm). The lanthionine conjugate of atrazine accounted for 18% TRR. The total residue identified in cane was 52.5% TRR. Autoclaving the cane residues in acid for 24 hours released G-34048 (32% TRR), GS-17794 (12% TRR), GS-17792 (2% TRR) and cyanuric acid (21%), products that could account for atrazine or any of its known metabolites; the total residue identified in sugarcane after hydrolysis was 66.5% TRR.

OPPTS GLN 860.1300: Nature of the Residue in Livestock

The nature of atrazine residues in livestock is adequately understood, based on adequate metabolism studies with cows, goats, and chickens. Atrazine metabolism in animals is similar to that in plants, involving de-alkylation and conjugation, with the triazine ring remaining intact.

Ruminants. Several studies have been reviewed pertaining to the ruminant metabolism of atrazine *per se*, atrazine plus simazine, hydroxy-metabolite G-34048, cloro-metabolite G-28273, and "biosynthesized residues" in/on atrazine-treated feed items. Dosing levels of atrazine *per se* ranged from 0.62 ppm to 44 ppm. The estimated maximum theoretical burden for cattle is ~5 ppm, driven primarily by a reassessed tolerance of 4 ppm for residues in/on sweet corn forage.

In cows dosed with [^{14}C]atrazine *per se* at 6.8 ppm, TRR were 0.87 ppm in liver, 0.24 ppm in meat, 0.15 ppm in fat, and 0.12 ppm in milk. The TRR for goats dosed with [^{14}C]atrazine *per se* at 5 ppm were within the same order of magnitude: 1.26 ppm in liver, 0.81 ppm in kidney, 0.13 ppm in meat, 0.06 ppm in fat, and 0.16 ppm in milk.

Milk from goats dosed at 33 ppm for 10 days contained the chloro-metabolite G-28273 as 45% of the TRR and G-28279 and G-30033 each at <1.5% TRR; the parent compound was not detected in goat milk. In tissues, atrazine was a minor residue and the total residue of parent and chloro-metabolites was <10% TRR. In liver the cysteine conjugate of G-30033 was characterized as 25-30% TRR, evidence of glutathione conjugation was observed, and mercapto and sulfoxide derivatives of chloro-metabolites were postulated.

TRR in samples from goats dosed with atrazine plus simazine each at 2.5 ppm, were comparable to those from atrazine alone: 1.29 ppm in liver, 0.69 ppm in kidney, 0.14 ppm in meat, 0.12 ppm in fat, and 0.09 ppm in milk. Likewise, TRR from goats dosed with the chloro-metabolite G-28273 at 5.8 ppm were 1.3 ppm in liver, 0.98 ppm in kidney, 0.34 ppm in meat, 0.09 ppm in fat, and 0.17 ppm in milk.

TRR in cows dosed with hydroxy-atrazine (G-34048) at 0.62 ppm were >10-fold lower in tissues and 3-fold lower in milk than from the parent compound dosed at the same level. A subsequent study with goats dosed with G-34048 at an average of 113 ppm for 4 days, showed average TRR of 1.18 ppm in liver, 0.21 ppm in muscle, 2.57 ppm in kidney, 0.09-0.16 ppm in fat, and 0.59 ppm in milk. Hydroxy-atrazine (the dosed compound) was the major residue accounting for 20% TRR in liver, 55% TRR in muscle, 49% TRR in fat, and 47% in milk. The total of free hydroxy-metabolites ranged from 27% TRR in liver to 73% TRR in muscle; the total of components containing an intact triazine ring was 81-90% TRR.

Poultry. TRR were 3.32 ppm in liver, 2.76 ppm in muscle, 0.47 ppm in fat, 1.77 ppm in skin/fat, and 2.64 and 1.4 ppm in egg yolks and whites, respectively, from chickens dosed with [^{14}C]atrazine at 58 ppm (~360x the maximum theoretical dietary exposure based on 80% corn grain). G-28273 was the major residue in egg yolk, egg white, and fat, accounting for 18, 65, and 26% TRR, respectively; this metabolite was detected at 7.3, 3.5, and 8.7% TRR, respectively, in muscle, liver, and skin/fat. Total chloro-triazine residues accounted for 9.4, 3.7, and 9.6 % TRR, in muscle, liver, and skin/fat, and 29, 81, and 28% TRR in egg yolk, egg white, and fat. In another study, hens were dosed with [^{14}C]atrazine for 20 days at 50 ppm. TRR were 3.15 ppm in liver, 3.4 ppm in muscle, 0.17-2.5 ppm in egg yolks, and 0.35-1.05 ppm in egg whites. Most of the TRR was unextractable, but protease digestion of the non-extracted residues released free chloro- and hydroxy-metabolites, cyanuric acid, and glutathione, mercapturic acid, and cystiene conjugates of atrazine.

<u>OPPTS GLN 860.1340: Residue Analytical Methods</u>

PAM, Vol. II includes Method A, a GC microcoulometric (MC) method for atrazine and the chloro-metabolites G-30033 and G-28279. Propazine Method IV is listed for metabolite G-28273.

GC/NPD methods have been used for data collection from crop matrices. The registrant has proposed GC/NPD method AG-484 as a tolerance enforcement method for determining the combined residues atrazine and its chloro-metabolites in plant commodities. The Agency has deferred review of ILV data available for this method because data were not provided for the total residue of concern, including the hydroxy-metabolites. Given the determination by the HED MARC to establish tolerances for the hydroxy metabolites of atrazine, an analytical method AG-484 (previously submitted to the Agency as MRID 40431365) capable of detecting each of the four hydroxy metabolites: 2-hydroxy-4-ethylamino-6-isopropylamino-s-triazine (G-34048), 2-amino-4-hydroxy-6-isopropylamino-s-triazine (GS-17794), 2-amino-4-hydroxy-6-ethylamino-s-triazine (GS-17792), and 2,4-diamino-6-hydroxy-s-triazine (GS-17791) at or below the proposed tolerances for the purposes of tolerance enforcement can be forwarded for ILV review.

GC/NPD Method AG-484 is acceptable for collecting data on residues of atrazine and its chloro-metabolites in/on crop commodities. The method has been extensively validated on plant commodities and previously deemed acceptable for data collection on crops by the Agency. In addition, the method has been successfully radiovalidated. The reported limits of quantitation (LOQs) for residues of each analyte range from <0.001ppm in refined sugar to <0.05 ppm in/on corn and sorghum commodities (grain, ears, and stover). The registrant must submit Method AG-484 for forwarding to ACB for PMV testing.

GC/NPD Method AG-484A, developed to lower the LOQ for residues of atrazine and the chloro-metabolites in/on forage for risk assessment, is marginally acceptable for data collection on corn and sorghum forage. Variable, often low procedural recoveries were obtained in corn and sorghum residue studies using this method; however, average method recoveries were typically acceptable for each analyte at each fortification level tested. Recoveries obtained for G-28279 in corn presented the one exception to this finding, for which overall recoveries averaged 59±21%, and 91 of 123 recoveries were unacceptable. The method has been subsequently validated by the registrant to a lower limit of 0.005 ppm for each analyte in corn and sorghum (forage, silage, and stover), and successfully radiovalidated on sorghum stover and silage bearing combined residues of -0.1 ppm.

HPLC/UV Method AG-596 (combining Methods AG-571 and AG-572) is adequate for collecting data on residues of the hydroxy-metabolites G-34048 and GS-17794 in/on crop commodities. Acceptable method validation and radiovalidation data have been submitted for this method. The validated LOQ for residues of G-34048 and GS-17794 in/on crop commodities is 0.02 ppm (0.01 ppm for wheat grain).

PAM, Vol. II Method III is adequate for enforcement of tolerances for residues of atrazine *per se* in milk, and has been validated to 0.003 ppm. However, this method would not be adequate to enforce tolerances for residues that include the chloro-metabolites.

Residue data reviewed in the 1988 SRR on atrazine and chloro-metabolites from milk and cattle tissues have been collected using GC methods AG-463 (AG-496A) and AG-476, respectively. GC method AG-593 has been used to analyze these same residues in poultry tissues and eggs. The LOQs for each

analyte were 0.01 ppm in all matrices. The milk and poultry methods have undergone successful ILV trials. Review of method AG-476 validation testing with beef tissues is pending. Methods AG-476, AG-496A, and AG-593 should be forwarded to ACB for PMV testing.

OPPTS GLN 860.1380: Storage Stability Data

Atrazine, G-30033, and G-28279 are stable in frozen storage (-15°C) in or on apple and corn raw agricultural and processed commodities for up to 25 months; G-28273 declined to 31-67% of initial values in apple fruit, dry pomace, and juice. Metabolite G-28273 is stable for up to 24 months in or on corn grain, meal, and crude oil and ears of sweet corn and for 14 months in or on corn silage and flour; however, at 24 months of frozen storage, residues of G-28273 were 52-67% of initial values in corn silage, and 67-80% of initial values in flour.

Given the evidence of decline of G-28273 residues in crops between 14 and 25 months of storage, additional storage stability data on the chloro-triazines are needed to support residue studies with sample storage intervals exceeding 25 months. These would include the crop field trials on sugarcane (samples stored for 32 months) and wheat (samples stored for 35 months), and the processing studies on corn (samples stored for 40 months), and sorghum (samples stored for 37 months). Data are required from a storage stability study depicting the stability of the chloro-triazines frozen in representative commodities (e.g, corn RACs and processed fractions) for up to 40 months.

The hydroxy-metabolites, G-34048 and GS-17794, are stable stored frozen in corn (stover and grain) and grain sorghum (forage) for up to 36 months. These data support the frozen storage intervals for the analysis of the hydroxy-metabolites reflected in the residue studies.

Atrazine and its chloro-metabolites were stable in frozen storage (-15°C) for up to 25 months in beef fat, tenderloin, and milk. Samples were generally stored for up to 24 months (the duration of the study) prior to analysis. These data support the frozen storage intervals for the analysis of atrazine and the chloro-metabolites in meat, milk, and fat reflected in the residue studies. In beef liver samples, atrazine was stable for up to 29 months of frozen storage; however, the chloro-metabolites showed significant declines in residue levels. After 29 months of frozen storage, residues of G-30033 and G-28279 in beef liver declined to 46% and 34% of initial values, respectively. Residues of G-28273 in beef liver declined to 45% of initial values within 6 months of storage. The decline of metabolite G-28273 in beef liver has been taken into consideration in reassessing the tolerance for residues in meat by-products (liver was stored up to 14 months).

In frozen poultry meat samples, atrazine and G-30033 were stable for up to 24 months, while G-28279 and G-28273 residues compared to initial values declined to 74% by 24 months and 48% by 29 months, respectively. Samples were generally stored for up to 24 months (the duration of the study) prior to analysis. These data support the frozen storage intervals for the analysis of atrazine and the chloro-metabolites in poultry meat reflected in the residue studies. Atrazine and its chloro-metabolites

showed varying degrees of decline in frozen egg samples. After 29 months of frozen storage, residues of atrazine, G-30033, G-28279 and G-28273 decreased to 74%, 56%, 52% and 28% of initial values, respectively.

OPPTS GLN 860.1500: Magnitude of the Residue in Crop Plants

Adequate field trial data are available on field corn, sweet corn, grain sorghum, guavas, and macadamia nuts. The adequacy of the submitted field trials for sugarcane and wheat is dependent on additional supporting data on storage stability.

Field corn. Data were submitted on field corn reflecting three treatment scenarios: (i) one preemergence application at 2.0 lb ai/A; (ii) a preemergence application at 0.5 lb ai/A followed by one postemergence application at 2.0 lb ai/A; and (iii) one preemergence application at 1.5 lb ai/A followed by one postemergence application at 1.0 lb ai/A. For scenario (ii), which represents the maximum use pattern, residues of atrazine and chloro-metabolites G-30033, G-28279, and G-28273 were each <LOQ (0.05 ppm) in corn grain. Combined chlorotriaizine residues were <0.2 ppm in/on 30 grain samples, and <0.2- 0.27 ppm (average, <0.204 ppm) in/on 28 stover samples. Combined chlorotriazine residues were <0.020 - 0.560 and <0.020 - 1.11 ppm in/on 29 or 30 forage samples harvested 30 or 60 days posttreatment, respectively; average combined residues were <0.118 ppm in 30-day forage and <0.078 ppm in 60-day forage.

Following split applications at 1.0 + 1.5 lb ai/A, residues of atrazine and chloro-metabolites G-30033, G-28279, and G-28273 were each <LOQ (0.05 ppm) in corn grain. Combined chlorotriaizine residues were <0.20 ppm in/on 30 corn grain samples and <0.20 - 0.25 ppm (average <0.202 ppm) in/on 30 stover samples harvested at maturity, 93-136 days posttreatment. Combined residues were <0.020 - 0.257 and <0.020 - 0.484 ppm in/on each of 30 corn forage samples harvested 30 and 60 days posttreatment, respectively; average combined residues were <0.056 ppm in 30-day forage and <0.048 ppm in 60-day forage.

Following a single preemergence application at 2.0 lb ai/A, residues of atrazine and chloro-metabolites G-30033, G-28279, and G-28273 were each <LOQ (0.05 ppm) in corn grain and stover. Combined the chlorotriaizines were below the combined LOQ (<0.20 ppm) in/on 40 grain and stover samples each harvested at maturity 129 -177 days posttreatment. Combined residues were <0.020 - 0.060 ppm (average <0.027 ppm) in/on 40 forage samples harvested 60 days posttreatment.

Residue data on two atrazine hydroxy-metabolites in field corn are available from a study reflecting a single postemergence application of atrazine at 3 lb ai/A (1.5x the maximum postemergence rate). G-34048 residues were <0.02 - 0.51 ppm (average, <0.213 ppm) and <0.02-0.18 (average <0.088 ppm) ppm in a total of 16 forage samples collected 30 - 31 or 58 - 83 days posttreatment; G-17794 residues were <0.02 - 0.44 ppm (average, <0.174 ppm) and <0.02 - 0.76 ppm (average, <0.286 ppm). G-34048 and G-17794 were each <LOQ (<0.02 ppm) in corn grain harvested 106 -136 days

posttreatment. Stover bore G-34048 residues of <0.02 - 0.27 ppm (average, 0.094 ppm) and G-17794 residues of <0.02 - 1.9 ppm (average, 0.52 ppm).

Grain sorghum. Data were submitted on grain sorghum reflecting three treatment scenarios: (i) one preemergence application at 2.0 lb ai/A; (ii) a preemergence application at 0.5 lb ai/A followed by one postemergence application at 2.0 lb ai/A; and (iii) one preemergence application at 1.5 lb ai/A followed by one postemergence application at 1.0 lb ai/A. For scenario (ii), which represents the maximum use pattern, residues of atrazine and chloro-metabolites G-30033, G-28279, and G-28273 were each <LOQ (0.05 ppm) in grain. Combined chlorotriaizine residues were <0.2 ppm (<LOQ) in/on 16 sorghum grain samples and <0.2 - 0.23 ppm (average, <0.202 ppm) in/on 15 stover samples. Combined chlorotriazine residues were <0.029 - 0.355 (average, <0.138 ppm) and <0.038 - 0.096 ppm (average, <0.060 ppm) in/on each of 32 forage samples harvested 30 or 45 days posttreatment.

Following split applications at 1.3 + 1.2 lb ai/A, residues of atrazine and chloro-metabolites G-30033, G-28279, and G-28273 were each <LOQ (0.05 ppm) in sorghum grain and stover. Combined chlorotriaizine residues were <0.20 ppm (<LOQ) in/on 15 grain samples and 16 stover samples harvested at maturity 72-114 days posttreatment. Combined residues were <0.021- 0.201 (average, <0.092 ppm) and <0.020 - 0.109 ppm (average, <0.045 ppm) in/on each of 30 forage samples harvested 30 or 45 days posttreatment, respectively.

Following a single preemergence application at 2.0 lb ai/A, residues of atrazine and chloro-metabolites G-30033, G-28279, and G-28273 were each <LOQ (0.05 ppm) in sorghum grain and stover. Combined chlorotriaizine residues <0.20 ppm (<LOQ) in/on 22 grain and stover samples harvested 108-145 posttreatment. Combined residues were <0.02 - 0.15 (average <0.065 ppm) and <0.020 - 0.18 ppm (average, <0.051 ppm) in/on each of 44 forage samples harvested 45 or 60 days posttreatment, respectively.

Sweet corn. Data were submitted on sweet corn reflecting three treatment scenarios: (i) one preemergence application at 2.0 lb ai/A; (ii) a preemergence application at 0.5 lb ai/A followed by one postemergence application at 2.0 lb ai/A; and (iii) one preemergence application at 1.5 lb ai/A followed by one postemergence application at 1.0 lb ai/A. For scenario (ii), which represents the maximum use pattern, residues of atrazine and chloro-metabolites G-30033, G-28279, and G-28273 were each <LOQ (0.05 ppm) in corn grain. Combined chlorotriaizine residues were below the combined LOQ (<0.20 ppm) in/on 10 treated ear samples (K+CWHR) harvested 40 -77 days posttreatment. Combined residues were <0.20 -1.59 ppm (average, 0.465 ppm) in/on 10 stover samples harvested 83-101 days after treatment. Combined chlorotriazine residues were <0.031-3.21 (average, 0.470 ppm) or <0.020-1.15 ppm (average, 0.174 ppm) in/on each of 20 forage samples harvested 30 or 45 days posttreatment, respectively.

Split applications at 1.5 + 1.0 lb ai/A resulted in combined residues of <0.020-0.409 (average, <0.098 ppm) or <0.020-0.345 ppm (average, <0.085 ppm) in/on each of 20 forage samples harvested 30 or 45 days posttreatment, respectively. Residues were below the combined LOQ (<0.20 ppm) in/on 10

treated ear samples harvested 40-77 days posttreatment. Combined residues were <0.20 - 0.61 ppm (average, 0.263 ppm) in/on 10 stover samples harvested 83-101 days after treatment.

Following a single preemergence application at 2.0 lb ai/A, combined chlorotriazine residues were <0.02 - 0.39 ppm (average, <0.028 ppm) in/on 16 forage samples harvested 45 posttreatment. Residues were below the combined LOQ (<0.20 ppm) in/on 16 treated ear samples harvested 70-120 days posttreatment. Combined residues were <0.2- 0.26 ppm (average, <0.204 ppm) in/on 16 stover samples harvested 113-144 days after treatment.

Wheat. The adequacy of the wheat residue trials are pending submission of supporting storage stability data. Residue data on wheat hay, which is now a regulated commodity of wheat (OPPTS GLN 860.1000, Table 1). As such, a tolerance for residues of atrazine and the chlorinated metabolites on wheat hay is required. In lieu of requiring field trial data for wheat hay, HED proposes establishing a wheat hay tolerance based on existing residue data on wheat forage. The existing tolerance for wheat forage has been reassessed as 1.5 ppm, based on available field trial data showing the highest residue in wheat forage at 1.11 ppm. Since wheat forage contains 25% dry matter, and wheat hay contains 88% dry matter, HED proposes establishing the wheat hay tolerance at 5 ppm reflective of any concentration of residues in wheat hay through the drying process in going from forage to hay. The registrant may otherwise submit field trial data for establishing tolerance level residues for atrazine and the chlorinated metabolites on wheat hay.

A tolerance for the hydroxy metabolites on wheat hay is also required. HED has proposed a reassessed tolerance for the hydroxy metabolites of atrazine on wheat forage at 0.5 ppm based on existing field trial data. HED further proposes a wheat hay tolerance for the hydroxy metabolites of atrazine of 1.5 ppm. The registrant may otherwise submit field trial data for establishing tolerance level residues for the hydroxy metabolites of atrazine on wheat hay.

Combined residues were <0.20 - 1.11 ppm and <0.20 - 0.84 ppm in/on 16 samples each of fall and spring forage, respectively, harvested 424-453 and 575-635 days after treatment of fallow fields with atrazine at 1 lb ai/A. Combined residues were <0.04 - 0.06 and <0.20 - 0.34 ppm in/on 16 samples each of grain and straw, respectively, harvested 642-721 days posttreatment.

Hydroxy-metabolites G-34048 and GS-17794 were respectively <0.02-0.05 and <0.02-0.26 ppm in/on 16 treated samples of fall forage, and <0.02-0.04 and <0.02-0.09 ppm in/on 16 treated samples of spring forage. G-34048 and GS-17794 residues were each <0.02 ppm (<LOQ) in/on 16 treated samples of grain. For straw, G-34048 residues were <0.02 ppm (<LOQ) and GS-17794 residues were <0.02-0.06 ppm in/on 16 treated samples.

Sugarcane. The adequacy of the sugarcane residue trials are pending submission of supporting storage stability data. Combined chlorotriazine residues were <0.20 ppm in/on 20 stripped cane samples harvested 116-123 days after four applications of atrazine at a 0.8-2x rate. Residues of hydroxy-metabolites G-34048 and GS-17794 were each <0.02 ppm (<LOQ) in/on 20 cane samples treated at 0.8-2x.

In a study reviewed in the 1983 residue chemistry chapter, combined residues of atrazine and three chloro-metabolites were #0.29 ppm in cane harvested 80-200 days after multiple treatments totaling 1-1.2x. Detectable residues of G-30033 at 0.07 and 0.09 ppm were found in two samples. These data were collected using a spectrophotometric method.

Guavas. Residues of atrazine *per se* were <0.002-0.011 ppm in/on 43 guava samples harvested 1-28 days following three to five applications at 0.75-5x. The Agency has waived additional data requirements for guavas.

Macadamia nuts. Residues of atrazine and its chloro-metabolites were <0.20 ppm (combined) in/on eight samples of nutmeats treated at 4 lb ai/A (1x).

OPPTS GLN 860.1520: Magnitude of the Residue in Processed Food/Feed

Pending submission of supporting storage stability data, adequate processing studies, analyzing atrazine and chloro-metabolites (G-30033, G-28279, and G-28273), and two hydroxy-triazine metabolites (G-34048 and GS-17794) were conducted on corn, sorghum, and wheat. Residues did not concentrate in corn commodities. GS-17794 concentrated by 2-3x in sorghum bran and grits; however, these sorghum commodities are not currently regulated.

The submitted sugarcane processing study is inadequate. The tests were conducted at only 2x the registered maximum rate and failed to obtain quantifiable residues of the chlorotriazines in/on the sugarcane RAC samples, although quantifiable residues were found in/on cane RAC samples treated at 1x in earlier studies (Residue Chemistry Chapter, 1983). The registrant reported no evidence of phytotoxicity at the 2x rate; the maximum concentration factor for sugarcane molasses is theoretically >20x. As a processing study conducted using cane samples fortified with atrazine and its chloro-metabolites (Atrazine SRR, 10/88) indicated that the combined residues of atrazine may concentrate in molasses by up to 6x, new processing data are required. Since a study conducted at 2X resulted in non-detectable residues in the sugarcane rac, and a study conducted at a maximumof 5X is expected to result in phytotoxicity in the sugarcane plant, the registrant is required to determine an acceptable application rate that will maximize the likelihood of obtaining detetable residues on the rac without causing injury to the plant, if possible, and conduct a new processing study at that application rate. Analyses for atrazine, its chloro- and hydroxy metabolites should be included for tolerance reassessment.

Analysis of the refined sugar samples for dietary risk purposes indicated that residues of each chlorotriazine analyte were <0.001 ppm following 2x treatment.

OPPTS GLN 860.1480: Magnitude of the Residue in Meat, Milk, Poultry, and Eggs

Atrazine and Chlorinated Metabolites

The animal diet provided in table 2 is based on tolerance level residues in the feed items. This diet is expected to result in the maximum theoretical dietary burden for ruminants, and has been used in tolerance reassessment.

Table 2. Calculation of maximum theoretical dietary burdens (MTDB) of livestock animals for atrazine.

Feed Commodity	% Dry Matter [a]	% Diet [a]	Tolerance (ppm) [b]	Dietary Contribution (ppm) [c]
Beef Cattle				
sweet corn forage	40	40	4	4.0
corn grain	88	50	0.2	0.11
sugarcane molasses	75	10	0.2	0.03
TOTAL BURDEN				4.14
Dairy Cattle				
sweet corn forage	40	50	4	5.0
corn grain	88	40	0.2	0.09
sugarcane molasses	75	10	0.2	0.03
TOTAL BURDEN				5.12
Poultry				
corn grain	NA	80	0.2	0.16
TOTAL BURDEN				0.16
Swine				
corn grain	NA	80	0.2	0.16
TOTAL BURDEN				0.16

[a] Table 1 (August 1996). [b] Current or reassessed tolerance from Table C; residues in/on sugarcane molasses is based upon the tolerance for sugarcane. [c] Contribution = [tolerance/%DM (if cattle)]X %diet).

Adequate feeding studies were submitted on cattle and poultry. The tables below summarize the residues of atrazine and chloro-metabolites in cattle and poultry tissues. Residues of atrazine, G-30033, and G-28279 were <LOQ (<0.01 ppm) in all samples from the cattle feeding studies at the low (3.75 ppm) and mid-dose (11.25 ppm) levels. Detectable levels of G-28273 resulted in combined residues of <0.06 ppm in milk, <0.05 ppm in muscle, <0.04 ppm in fat, and 0.044 ppm in kidney from cattle dosed with atrazine at 3.75 ppm (0.7x the maximum theoretical dietary burden of 5.12 ppm). Detectable levels of G-28273 resulted in combined residues of <0.15 ppm in milk, <0.09 ppm in muscle, <0.042 ppm in fat, 0.058 ppm in liver, and 0.061 ppm in kidney from cattle dosed with atrazine at 11.25 ppm (2.2x).

In poultry dosed at 9.4x, atrazine, G-30033, G-28279, and G-28273 were <LOQ (<0.05 ppm for liver, <0.01 ppm for other matrices); combined residues were <0.04 ppm in eggs, muscle, and skin, and <0.20 ppm in liver. Because combined residues were <LOQ at the 9.4x feeding level, HED

concludes that there is no reasonable expectation of finding quantifiable atrazine residues in eggs or the meat, fat, or meat byproducts of poultry [40 CFR 180.6(a)(3)]; therefore, tolerances for atrazine residues in eggs and meat, fat, and meat byproducts of poultry should be revoked. (HED Chem SAC decision memorandum D269608, C. Eiden, 10/15/00).

The 11 ppm dose level used in the ruminant feeding study is equivalent to 70x the maximum dietary burden for swine (0.16 ppm). Based on the residue data for ruminants and the dietary burden for swine, HED concludes that there is no reasonable expectation of finding quantifiable atrazine residues in meat, fat, or meat byproducts of hogs [40 CFR 180.6(a)(3)]; therefore, tolerances for atrazine residues in meat, fat, and meat byproducts of hogs should be revoked. (HED Chem SAC decision memorandum D269608, C. Eiden, 10/15/00).

For purposes of dietary exposure assessment, the Agency has determined that it is reasonable to use available data from cattle metabolism studies. Tables 3 and 4 provide residue data from animal feeding studies used in tolerance reassessment and dietary exposure assessments.

Table 3. Residues of atrazine and chloro-metabolites in milk and beef tissues.

Dose (ppm)	Residues (ppm)				
	Atrazine	G-30033	G-28279	G-28273	Combined [a]
Milk					
3.75	<0.01	<0.01	<0.01	<0.01-0.03	<0.06
11.25	<0.01	<0.01	<0.01	<0.01-0.12	<0.15
37.5	<0.01	<0.01-0.03	<0.01-0.02	0.20-0.41	<0.47
Muscle					
3.75	<0.01	<0.01	<0.01	<0.01-0.02	<0.05
11.25	<0.01	<0.01	<0.01	0.02-0.060	<0.09
37.5	<0.01	<0.01	<0.01	<0.04-0.102	<0.105
Fat					
3.75	<0.01	<0.01	<0.01	<0.01-0.01	<0.04
11.25	<0.01	<0.01	<0.01	<0.01-0.012	<0.042
37.5	<0.01	<0.01	<0.01	0.018-0.022	<0.052
Liver					
3.75	<0.01	<0.01	<0.01	<0.01	<0.04
11.25	<0.01	<0.01	<0.01	0.01-0.025	<0.058

Table 3. Residues of atrazine and chloro-metabolites in milk and beef tissues.					
Dose (ppm)	Residues (ppm)				
	Atrazine	G-30033	G-28279	G-28273	Combined [a]
37.5	<0.01	<0.01	<0.01	0.078-0.115	<0.145
Kidney					
3.75	<0.01	<0.01	<0.01	0.01-0.014	<0.044
11.25	<0.01	<0.01	<0.01	0.02-0.031	<0.061
37.5	<0.01	<0.01	<0.01	0.058-0.087	<0.117

[a] Maximum combined residues.

Table 4. Residues of atrazine and chloro-metabolites in eggs and poultry tissues.					
Dose (ppm)	Residues (ppm)				
	Atrazine	G-30033	G-28279	G-28273	Combined [a]
Eggs					
0.5	<0.01	<0.01	<0.01	<0.01	<0.04
1.5	<0.01	<0.01	<0.01	<0.01	<0.04
5.0	<0.01	<0.01	<0.01	0.07	0.10
Muscle					
0.5	<0.01	<0.01	<0.01	<0.01	<0.04
1.5	<0.01	<0.01	<0.01	<0.01	<0.04
5.0	<0.01	<0.01	<0.01	<0.02-0.03	<0.06
Skin					
0.5	<0.01	<0.01	<0.01	<0.01	<0.04
1.5	<0.01	<0.01	<0.01	<0.01	<0.04
5.0	<0.01	<0.01	<0.01	0.02	<0.05
Fat					
0.5	<0.01	<0.01	<0.01	<0.01	<0.04
1.5	<0.01	<0.01	<0.01	<0.01	<0.04
5.0	<0.01	<0.01	<0.01	<0.01	<0.04
Liver					

Table 4. Residues of atrazine and chloro-metabolites in eggs and poultry tissues.					
Dose (ppm)	Residues (ppm)				
	Atrazine	G-30033	G-28279	G-28273	Combined [a]
0.5	<0.05	<0.05	<0.05	<0.05	<0.20
1.5	<0.05	<0.05	<0.05	<0.05	<0.20
5.0	<0.05	<0.05	<0.05	<0.05	<0.20

[a] Maximum combined residues.

Hydroxy Metabolites

Atrazine's hydroxy metabolites may occur in ruminant, poultry, and hog feed items, but at very low levels. There are no tolerances for hydroxy residues of atrazine, at this time. The tolerance proposed for residues of the hydroxy metabolites of atrazine in corn forage is 2 ppm. The proposed tolerance for hydroxy metabolites of atrazine in corn grain is 0.08 ppm. The proposed tolerance for residues of hydroxy metabolites in sugarcane is 0.08 ppm. A new field trial/processing study is being required for sugarcane for the purpose of reassessing a tolerance for sugarcane molasses. Although there is no proposed tolerance for sugarcane molasses at this time, residues from the existing field trial/processing study showed non-detectable residues of each of the four hydroxy atrazine compounds at a LOD of 0.05 ppm (each). Proposed tolerances for corn forage (2 ppm) and grain (0.08 ppm) and a value of 0.2 ppm (0.05 x 4) for sugarcane molasses have been used as a surrogate value to estimate maximum theoretical dietary burdens (MTDB) for ruminants, poultry and hogs as shown in Table 5.

Table 5. MTDB Based on Proposed Tolerances for Hydroxy Metabolites in Livestock Feeds (ppm)				
Feed Commodity	% Diet	% Dry Matter	Proposed Tolerance (ppm)	Dietary Contribution (ppm)
Cows (Beef)				
corn forage	40	40	2	2
corn grain	50	88	0.08	0.05
sugarcane molasses	10	75	0.2	0.03
TOTAL BURDEN				2.08
Cows (Dairy)				
corn forage	50	40	2	2.5
corn grain	40	88	0.08	0.04
sugarcane molasses	10	75	0.20	0.03
TOTAL BURDEN				2.58
Poultry				
corn grain	80	N/A	0.08	0.06
TOTAL BURDEN				0.06
Swine				
	80	N/A	0.08	0.06

Table 5. MTDB Based on Proposed Tolerances for Hydroxy Metabolites in Livestock Feeds (ppm)				
Feed Commodity	% Diet	% Dry Matter	Proposed Tolerance (ppm)	Dietary Contribution (ppm)
TOTAL BURDEN				0.06

Although an animal feeding study with cows was not available, an animal feeding study using goats dosed at 113 ppm was. The tolerance-based MTDB for atrazine's hydroxy metabolites in the diets of dairy and beef cows is provided in Table 5. Residue levels in milk and meat tissues of goats from the goat feeding study are provided in Table 6. There were no residue data at the 10X feeding level for comparison.

Table 6. Residues of atrazine hydroxy metabolites in goat tissues and milk (ppm)				
Matrix	G-34048	G-17792	G-17794	Combined hydroxy
Liver	0.238	0.039	0.039	0.316
Kidney	1.523	0.077	0.216	1.523
Tenderloin	0.115	0.029	0.008	0.152
Perirenal fat	0.079	0.019	0.005	0.103

The MTDBs are approximately 2.08, 2.58, and 0.06 ppm, respectively, for beef cattle, dairy cattle, and poultry and hogs. The dosing level used in the animal feeding study of 113 ppm of hydroxy atrazine([^{14}C]G-34048). Therefore, the dosing level used in the goat feeding study represents 54X, 44X, and 1883X of the MTDBs for beef cattle, dairy cattle, and poultry and hogs, respectively.

A more refined estimate of the theoretical dietary burden can be obtained using field trial data (highest average field trial, HAFT) to estimate the theoretical dietary burden. This approach would be expected to provide a more realistic estimate of residues to which animals may be exposed to in their feeds. For the chronic assessment for hydroxyatrazine, values were calculated as follows:

Table 7. Table of Data for Estimation of Hydroxy-metabolites of Atrazine in Meat						
Commodity	Mean Field Trial Hydroxy-triazine Residue (ppm)	Mean % Crop-Treated	%CT-Adjusted Residue	% Dry Matter	Fraction of the Diet	Dietary Burden of Hydroxy-triazines (ppm)
Field Corn Forage	0.123	82	0.1	48	0.40	0.084
Corn Grain	0.042	82	0.034	88	0.50	0.0193
Molasses	0.031	76	0.024	75	0.10	0.0031
					Total	0.1064

The estimated TDB is 0.1064 ppm, thus the 113 ppm dosing level in the goat feeding and metabolism study represents a 1060X exaggerated rate. After dosing at 113 ppm hydroxyatrazine, the combined residues of atrazine's hydroxy metabolites in liver were 0.316 ppm; in kidney were 1.523 ppm; in meat were 0.152 ppm; and in fat were 0.103 ppm. These residues were extrapolated to the TDB of 0.1064 ppm resulting in the following ARs for hydroxy metabolites for chronic dietary exposure assessment: 0.00030 ppm (0.316/1060) in liver, 0.0014 ppm (1.523/1060) in kidney, 0.00014 ppm (0.152/10620 in muscle, and 0.000098 ppm (0.103/1060) in fat.

Based on the TDB resulting from anticipated residues for the hydroxy metabolites of atrazine in feed items, and the results of the goat feeding study, HED has determined that there is no reasonable expectation of the residues of the hydroxy metabolites of atrazine in ruminant meat and milk, as well as poultry tissues and eggs, and hog tissues, and that these commodities should be classified under category 180.6(a)3. HED has determined that tolerances for residues of the hydroxy metabolites are not warranted for these animal commodities.

The HED Chemistry Science Assessment Review Committee (Chem SAC) met on 10/11/00 to consider classification of residues of atrazine, the chloro-metabolites, and hydroxy metabolites in hog tissues, and poultry tissues and eggs as 180.6(a)3, "no reasonable expectation of finite residues". This decision was based largely on the results of animal feeding studies, in which, residues of atrazine were non-detectable at theoretical dietary burdens. (HED Chem SAC decision memorandum, D269608, C. Eiden, 10/15/00).

OPPTS GLN 860.1400: Magnitude of the Residue in Water, Fish, Irrigated Crops

Atrazine is not registered for aquatic use; therefore, no residue chemistry data are required under this guideline topic.

OPPTS GLN 860.1460: Magnitude of the Residue in Food-handling Establishments

Atrazine is not registered for use in food-handling establishments; therefore, no residue chemistry data are required under these guideline topics.

OPPTS GLNs 860.1850 and 860.1900: Confined and Field Accumulation in Rotational Crops

An adequate confined rotational crop study demonstrated that metabolism in rotated crops proceeds via essentially the same pathway as that in primary crops.

Limited field rotational crop studies provided data on residues of atrazine and chloro-metabolites and two hydroxy-metabolites (G-34048 and G-17794) in representative rotational crops (leaf lettuce/spinach, potatoes, wheat, and soybean) planted 5 months (lettuce and wheat only) and 10-12 months following a single postemergence application of the atrazine (4 lb/gal FlC) at 3 lb ai/A/season

(1.2x the current maximum seasonal rate and 1.5x the current maximum postemergence rate) to a primary corn crop.

Chlorotriazine residues were non-quantifiable in/on representative rotational crop commodities with few exceptions: Residues of G-28273 were 0.10 ppm in one treated lettuce sample from the 5-month plant-back interval (PBI). In one wheat trial (5-month PBI; CA) residues of atrazine were 0.06 ppm, and G-30033 residues were 0.06-0.09 ppm in/on two treated fall forage samples; G-28273 residues were 0.06 ppm in/on two treated straw samples. [Although data were not available on wheat from later PBIs, the [^{14}C]atrazine confined study indicated that total chlorotriazine residues may be expected to decline to levels below the method LOQs for wheat forage, grain, and straw at the 9-month PBI.] In addition, two treated soybean forage samples collected from the 11-12 month PBI bore residues of G-28279 and G-30033 at 0.11-0.12 and 0.08-0.09 ppm, respectively.

Residues of both hydroxy-metabolites were <0.02 ppm (<LOQ) in/on treated samples of rotational crops, with the exception of two treated samples of straw (CA test; 5-month PBI) and soybean forage (NY test; 12-month PBI) that each contained residues of GS-17794 at 0.03 ppm.

As the current atrazine EP labels specify a rotational crop restriction of 12 months for rotational crops other than sorghum and corn, tolerances for residues of atrazine in certain rotational crops (small grains, leafy vegetables, and root crops) will not be required. However, as quantifiable chlorotriazine residues were detected in soybean forage collected from the 12-month PBI (NY test) limited field trials are required, as described under OPPTS.GLN 860.1900, to determine appropriate tolerances for inadvertent residues of atrazine in the foliage of legume vegetables.

Table B. Residue Chemistry Science Assessments for Reregistration of Atrazine.

GLN: Data Requirements	Current Tolerances, ppm [40 CFR]	Must Additional Data Be Submitted?	References [1]
860.1200: Directions for Use	N/A = Not Applicable	Yes [2]	
860.1300: Plant Metabolism	N/A	No	00023324 00023529 00022474 00024786 00055672 **00149428 00161854 00016306** 41209801 [3] 42547116 [4] 42547115 [4] 43016503 [5] 43048501 [6] 43598628 [7] 43598629 [8] 44152119 [9] 44152120 [16] 44152121 [9] 44315408 [9] 44331409 [16]
861.1300: Animal Metabolism	N/A	No	00022857 00038297 **00161854 00016306 00038294 40431352 40431353 40431354 40431355 40431356 40431357 40437502** 41209802 [3] 41209803 [3] 41209804 [3] 41209806 [3] 41209807 [3] 41209808 [3] 42925601 [10] 43508501 [10] 43934412 [11]
860.1340: Residue Analytical Methods			
- Plant commodities	N/A	Yes [12]	00016401 00016402 00016403 00023499 00023502 00024480 00024482 00055644 00093520 **40431365** 41397102 [13] 42547118 [4] 42547119 [4] 43016504 [5] 44315412 [9] 43395202 [9]
- Animal commodities	N/A	Yes [12]	00023280 00023502 **00161854 40431364 40431369 40431370 40431422 40431424** 41397103 [13] 42547120 [4] 42547121 [4] 42547122 [4] 42547123 [4]
860.1360: Multiresidue Methods	N/A	No	41423401 [14]

(continued; footnotes follow)

Table B. continued.

GLN: Data Requirements	Current Tolerances, ppm [40 CFR]	Must Additional Data Be Submitted?	References [1]
860.1380: Storage Stability Data	N/A	Yes [15]	00024482 **40431421** **40431426** 41258601 [16] 41258602 [16] 41258603 [16] 41397101 [16] 43315503 [9]
860.1500: Magnitude of the Residue in Plants			
Tree Nuts			
- Macadamia nuts	0.25 [§180.220(a)]	No	00024799 **40431418**
Cereal Grains			
- Corn, field and sweet, K+CWHR	0.25 [§180.220(a)]	No	00094135 00093523 **40431401** 42547117 [4] 43598630 [17] 44152117 [9] 44315410 [9] 44597602 [9]
- Sorghum grain	0.25 [§180.220(a)]	No	00093523 **40431383** 43598631 [17] 43598632 [17] 44315411 [9] 44597603 [9]
- Wheat grain	0.25 [§180.220(a)]	No	00024475 **40431420** 43160502 [9]
Forage, Fodder, and Straw of Cereal Grains			
- Corn forage and stover	15 [§180.220(a)]	No	00093520 00093523 00094135 **40431401** 43598630 [17] 44152117 [9] 44315410 [9] 44597602 [9]
- Sorghum forage and stover	15 [§180.220(a)]	No	00093523 **40431383** 43598631 [17] 43598632 [17] 44315411 [9] 44597603 [9]
- Wheat forage, fodder, and straw	5 [§180.220(a)]	Yes [18]	00024475 **00067425** **40431420** 43160502 [9]
Grasses			
- Orchardgrass, orchardgrass hay, rye, perennial	15 [§180.220(b)]	No	00024487 GS006235
- range	15 [§180.220(b)]	No	**00126712** GS006235
Miscellaneous Commodities			

(continued; footnotes follow)

Table B. continued.

GLN: Data Requirements	Current Tolerances, ppm [40 CFR]	Must Additional Data Be Submitted?	References [1]
- Guava	0.05 [§180.220(a)]	No	00055643
- Sugarcane	0.25 [§180.220(a)]	No	00115588 43160504 [9]

(continued; footnotes follow)

Table B. continued.

GLN: Data Requirements	Current Tolerances, ppm [40 CFR]	Must Additional Data Be Submitted?	References [1]
860.1520: Processed Commodities			
- Corn	None	No	43160505 [9]
- Sorghum	None	No	43160503 [9]
- Sugarcane	None	Yes [19]	43160504 [9] 43395504 [9]
- Wheat	None	No	43160502 [9]
860.1480: Meat, Milk, Poultry, Eggs			
- Milk and fat, meat, meat byproducts of cattle, goats, hogs, horses, sheep	0.02 [§180.220(a)]	No	00026977 00080629 00093524 **40431424**
- Eggs and the fat, meat, meat byproducts of poultry	0.02 [§180.220(a)]	No	**40431422 40431423**
860.1400: Water, Fish, Irrigated Crops	N/A		
860.1460: Food Handling	N/A		
860.1850: Confined Rotational Crops	N/A	No	43016505 [5]
860.1900: Field Rotational Crops	None	Yes [20]	43160501 [9]

1. References were reviewed in the 1983 Residue Chemistry Chapter, **the 1988 Second Round Review (bold),** or as otherwise noted.

2. The following label revisions are required: Use directions for macadamia nuts state that applications may be repeated as necessary. The statement should be replaced to indicate the maximum seasonal rate and a minimum retreatment interval. The prohibition against the grazing of treated corn crops should be deleted from the both labels. Current Agency policy does not allow the prohibition against the use of significant livestock feed items, such as corn forage. The labels should be amended to include a pregrazing/preharvest interval (PGI/PHI) for corn forage; the available residue data would support a 30-day PGI/PHI for corn forage.

3. CB No. 5783, No DP Barcode, 5/3/90, M. Metzger.

4. CBRS No. 10980, DP Barcode D185491, 6/3/93, J. Abbotts.

5. CBRS No. 12889, DP Barcode D197234, 6/29/95, J. Abbotts.

6. CBRS No. 13059, DP Barcode D198106, 5/22/95, J. Abbotts.

7. CBRS No. 15632, DP Barcode D215500, 7/6/95, J. Abbotts

8. CBRS No. 15633, DP Barcode D215509, 7/6/95, J. Abbotts.

9. DP Barcodes D239253 and D248091, 1015/00, D. Soderberg.

Table B. continued.

10. CBRS No. 12607, DP Barcode D195321, 1/2/96, J. Abbotts.

11. CBRS No. 16986, DP Barcode D223985, 5/14/96, J. Abbotts.

12. The registrant must submit an analytical method capable of detecting each of the four hydroxy metabolites: 2-hydroxy-4-ethylamino-6-isopropylamino-s-triazine (G-34048), 2-amino-4-hydroxy-6-isopropylamino-s-triazine (GS-17794), 2-amino-4-hydroxy-6-ethylamino-s-triazine (GS-17792), and 2,4-diamino-6-hydroxy-s-triazine (GS-17791) at or below the proposed tolerances for the purposes of tolerance enforcement for Agency review. Methods AG-484 (plants), AG -496A (milk), and AG-476 (beef tissues) should be forwarded to ACB for PMV testing.

13. Not yet reviewed by the Agency; cited in CB Nos. 6796 and 6797, 7/26/90, M. Metzger. This method should be forwarded to ACB for PMV testing.

14. CB Nos. 6796 and 6797, 7/26/90, M. Metzger

15. Additional storage stability data on atrazine and chloro-metabolites are required to support the following samples from field trial studies: sugarcane (stored 32 months), and wheat commodities (stored 35 months), and to support samples of corn processed commodities (stored 40 months), and sorghum processed commodities (stored 37 months).

16. CBRS No. None, DP Barcode None, 2/8/96, J. Abbotts.

17. CBRS Nos. 15629, 15635, 15636, DP Barcodes D215518, D215514, D215513, 8/1/95, J. Abbotts.

18. Residue data on wheat hay, which is now a regulated commodity of wheat (OPPTS GLN 860.1000, Table 1). As such, a tolerance for residues of atrazine and the chlorinated metabolites on wheat hay is required. In lieu of requiring field trial data for wheat hay, HED proposes establishing a wheat hay tolerance based on existing residue data on wheat forage. The existing tolerance for wheat forage has been reassessed as 1.5 ppm, based on available field trial data showing the highest residue in wheat forage at 1.11 ppm. Since wheat forage contains 25% dry matter, and wheat hay contains 88% dry matter, HED proposes establishing the wheat hay tolerance at 5 ppm reflective of any concentration of residues in wheat hay through the drying process in going from forage to hay. The registrant may otherwise submit field trial data for establishing tolerance level residues for atrazine and the chlorinated metabolites on wheat hay.

    A tolerance for the hydroxy metabolites on wheat hay is also required. HED has proposed a reassessed tolerance for the hydroxy metabolites of atrazine on wheat forage at 0.5 ppm based on existing field trial data. HED further proposes a wheat hay tolerance for the hydroxy metabolites of atrazine of 1.5 ppm. The registrant may otherwise submit field trial data for establishing tolerance level residues for the hydroxy metabolites of atrazine on wheat hay.

19. An additional processing study is required to determine whether or not residues concentrate in sugarcane molasses from a study conducted at an application rate that will maximize the likelihood of detectable residues on the sugarcane rac without causing injury to the crop. The study should include the analyses for atrazine, its chloro- and hydroxy metabolites for the purposes of tolerance reassessment.

20. As quantifiable chlorotriazine residues were detected in soybean forage collected from the 12-month PBI (NY test) limited field trials are required, as described under OPPTS.GLN 860.1900, to determine appropriate tolerances for inadvertent residues of atrazine in the foliage of legume vegetables.

TOLERANCE REASSESSMENT SUMMARY

Tolerances established under 40 CFR §180.220(a)(1) are defined for residues of atrazine *per se*. Tolerances established under 40 CFR §180.220(a)(2) are defined for atrazine and its metabolites 2-amino-4-chloro-6-ethylamino-*s*-triazine (G-28279), 2-amino-4-chloro-6-isopropylamino-*s*-triazine (G-30033), and 2-chloro-4,6-diamino-*s*-triazine (G-28273). The tolerances under §180.220(a)(2) for *orchard grass, and orchard grass, hay* should be revoked, as these uses are not supported by the basic producer.

In accordance with the Metabolism Assessment Review Committee (MARC) decision dated 11/15/00, the tolerance expression in 40 CFR §180.220(a)(1) should be changed to reflect the combined residues of atrazine and its metabolites: 2-amino-4-chloro-6-ethylamino-*s*-triazine (G-28279), 2-amino-4-chloro-6-isopropylamino-*s*-triazine (G-30033), and 2-chloro-4,6-diamino-*s*-triazine (G-28273). All tolerances based on atrazine and its chloro-metabolites should be placed together under 40 CFR § 180.220 (a)(1). A summary of atrazine tolerance reassessments is presented in Table C; reassessments are based on tolerances redefined as atrazine and chloro-metabolites.

Also in accordance with the Metabolism Assessment Review Committee (MARC) decision dated 11/15/00, a new tolerance expression for the combined residues of each of the four hydroxy metabolites: 2-hydroxy-4-ethylamino-6-isopropylamino-s-triazine (G-34048), 2-amino-4-hydroxy-6-isopropylamino-s-triazine (GS-17794), 2-amino-4-hydroxy-6-ethylamino-s-triazine (GS-17792), and 2,4-diamino-6-hydroxy-s-triazine (GS-17791) should be established under 40 CFR § 180.220 (a)(2) once all existing tolerances for atrazine and the chloro-metabolites are placed under 40 CFR §180.220(a)(1). A summary of the tolerances proposed under this new tolerance expression are given in Table C.

Tolerances Listed Under 40 CFR §180.220(a)(1):

Tolerances for residues in/on sweet corn forage and fodder can be lowered to 2.0 and 4.0 ppm, respectively, to 1.5 ppm for field/pop corn forages, and to 0.5 ppm for field/pop corn fodder; the designation "fodder" should be revised to "stover." The tolerances for residues in/on corn, fresh, K+CWHR and corn grain can be decreased to 0.20 ppm, each (based on combined non-detectable residues at 0.05 ppm for atrazine and each chloro-metabolite). The tolerance for residues in/on macadamia nuts can be lowered to 0.20 ppm (based on combined non-detectable residues at 0.05 ppm for atrazine and each chloro-metabolite). Tolerances for residues in/on sorghum forage and fodder can be lowered to 0.50 ppm, each; the designation "fodder" should be revised to "stover." The tolerance for residues in/on sorghum grain can be lowered to 0.20 ppm (based on combined non-detectable residues at 0.05 ppm for atrazine and each chloro-metabolite). The tolerances for residues in/on wheat fodder, grain, and straw can be lowered to 1.5, 0.10, and 0.50 ppm, respectively; the designation "fodder" should be revised to "forage." The tolerance for sugar cane can be lowered to 0.2 ppm (based on combined non-detectable residues at 0.05 ppm for atrazine and each chloro-metabolite). The tolerances for residues in/on sugarcane, forage and fodder, should be revoked, as

these are no longer regulated as livestock feed items. The tolerance for residues in/on guavas is adequate.

The tolerances for residues in commodities from cattle, goats, horses, and sheep must be increased to include combined residues of atrazine and chloro-metabolites. The tolerance for meat byproducts is based on non-detectable residues at 0.02 ppm that has been increased by a factor of 5X to account for losses of the atrazine chloro-metabolite, diamino chlorotriazine (G-28273) in liver stored up to 14 months prior to analysis. The chloro-metabolite decreased by 45% within 6 months of storage. It is assumed it would decrease by that much again during another 6 to 8 months of storage. If a 45% loss occurs after 6 months of storage, total residues could be further decreased to 20% of the original concentration after 14 months of storage.

The tolerances for commodities from hogs and poultry can be revoked as there is no reasonable expectation of finite residues.

Tolerances Needed Under 40 CFR §180.220(a)(1):

HED proposes establishing a tolerance for residues of atrazine and the chlorinated metabolites in wheat hay based on existing wheat forage residue data, and taking into account any concentration of residues during drying processes for hay. Alternatively, the registrant may submit field trials to determine an appropriate tolerance level for residues in/on wheat hay.

An additional processing study is required for sugarcane, in order to determine the need for a separate tolerance for residues in molasses.

Tolerances Currently Listed Under 40 CFR §180.220(a)(2) To Be Placed Under 40 CFR §180.220(a)(1):

Currently, there are four products with labelled uses on pasture land and rangeland on terrestrial feed items (forages and fodder) or for road side (right-of-way) uses. Valent Atrazine 90DF (59639-106), Riverside Atrazine 90 DF (9779-253) and Oxon Italia 5 L (35915-5) are labelled for application to roadsides at 2 pints and acre, and allow application to Conservation Reserve Program (CRP) land in NE, OR, OK, and TX at 2.2 lbs product/A. Drexel Atrazine 4L (19713-11) is labelled for roadside uses, only. Both of these use patterns include prohibitions against grazing or cutting for hay. Novartis does not support orchard grass and hay uses. HED recommends that the established tolerances for residues in/on *orchard grass and orchard grass, hay* should be revoked as these uses are not supported by the basic producer.

Tolerances To Be Established Under 40 CFR § 180.220 (a)(2):

Tolerances for the combined residues of each of the four hydroxy metabolites: 2-hydroxy-4-ethylamino-6-isopropylamino-s-triazine (G-34048), 2-amino-4-hydroxy-6-isopropylamino-s-triazine (GS-17794), 2-amino-4-hydroxy-6-ethylamino-s-triazine (GS-17792), and 2,4-diamino-6-hydroxy-s-

triazine (GS-17791) should be established as listed in Table C for the following 18 raw agricultural commodities: field corn forage and stover; sweet corn forage and stover; pop corn forage and stover; corn, fresh (K+CWHR); field corn grain; guava; macadamia nuts; rye grasses, perrenial; sorghum forage and stover; sorghum grain; sugarcane; wheat straw and stover; wheat grain.

HED proposes establishing a tolerance for residues of the hydroxy metabolites of atrazine in wheat hay based on existing wheat forage residue data, and taking into account any concentration of residues during drying processes for hay. Alternatively, the registrant may submit field trials to determine an appropriate tolerance level for residues in/on wheat hay.

A tolerance for the combined residues of the hydroxy metabolites of atrazine is needed for sugarcane molasses

Table C. Tolerance Reassessment Summary for Atrazine.

Commodity	Established Tolerance, ppm	Reassessed Tolerance, ppm	Comments [*Correct Commodity Definition*]
Tolerances Listed Under 40 CFR §180.220(a)(1)[1]			
Cattle, fat	0.02	0.05	
Cattle, mbyp	0.02	0.10	
Cattle, meat	0.02	0.10	
Corn, fodder, field	15	0.5	*corn, field,stover*
Corn, fodder, pop	15	0.5	*corn, pop, stover*
Corn, fodder, sweet	15	2.0	*corn, fresh, stover*
Corn, forage, field	15	1.5	
Corn, forage, pop	15	1.5	
Corn, forage, sweet	15	4.0	
Corn, fresh, K+CWHR	0.25	0.20	
Corn, grain	0.25	0.20	
Eggs	0.02	Revoke	HED concludes that there is no reasonable expectation of finding quantifiable atrazine residues in eggs or the meat, fat, or meat byproducts of poultry
Goats, fat	0.02	0.05	
Goats, mbyp	0.02	0.10	
Goats, meat	0.02	0.10	
Guava	0.05	0.05	
Hogs, fat	0.02	Revoke	HED concludes that there is no reasonable expectation of finding quantifiable atrazine residues in the meat, fat, or meat byproducts of hogs.
Hogs, mbyp	0.02	Revoke	
Hogs, meat	0.02	Revoke	
Horses, fat	0.02	0.05	
Horses, mbyp	0.02	0.10	
Horses, meat	0.02	0.10	
Macadamia nuts	0.25	0.20	
Milk	0.02	0.10	
Poultry, fat	0.02	Revoke	HED concludes that there is no reasonable expectation of finding quantifiable atrazine residues in eggs or the meat, fat, or meat byproducts of poultry.
Poultry, mbyp	0.02	Revoke	
Poultry, meat	0.02	Revoke	
Rye,grasses, perennial	15	15	Uses are restricted to the Conservation Reserve Program (CRP) lands in OK, OR, NE, and TX. Restrictions on grazing and cutting for hay apply.
Sheep, fat	0.02	0.05	
Sheep, mbyp	0.02	0.10	

Commodity	Established Tolerance, ppm	Reassessed Tolerance, ppm	Comments [*Correct Commodity Definition*]
Sheep, meat	0.02	0.10	
Sorghum, fodder	15	0.50	*Sorghum, stover*
Sorghum, forage	15	0.50	
Sorghum, grain	0.25	0.20	
Sugarcane	0.25	0.20	
Sugarcane, fodder	0.25	Revoke	Not a significant livestock feed item
Sugarcane, forage	0.25	Revoke	Not a significant livestock feed item
Wheat, fodder	5	1.5	*Wheat, forage*
Wheat, grain	0.25	0.10	
Wheat, straw	5	0.50	
Tolerances Listed Under 40 CFR §180.220(a)(2) To be Places Under 40 CFR §180.220(a)(1)[1]			
Grasses, orchardgrass	15	Revoke	Uses on orchard grass are not supported by the basic producer
Grasses, orchardgrass, hay	15	Revoke	Uses on orchard grass are not supported by the basic producer
Grasses, range	4	4	Uses are restricted to the Conservation Reserve Program (CRP) lands in OK, OR, NE, and TX. Restrictions on grazing and cutting for hay apply.
Tolerances Needed Under 40 CFR §180.220(a)(1)[1]			
Sugarcane molasses	none	tbd [2]	additional data are required to determine the need for a separate tolerance
Wheat, hay	none	5	HED proposes this tolerance based on residue data for wheat forage, taking into account concentration of residues as forage is dried to hay. Alternatively, the registrant may provide residue data on wheat hay from field trials.
Tolerances to be Established Under 40 CFR §180.220(a)(2)[3]			
Corn, stover, field	none	4	
Corn, stover, pop	none	4	
Corn, stover, sweet	none	4	
Corn, forage, field	none	2	
Corn, forage, pop	none	2	
Corn, forage, sweet	none	2	
Corn, fresh, K+CWHR	none	0.08	
Corn, grain	none	0.08	
Guava	none	0.05	
Macadamia nuts	none	0.25	
Rye grasses, perrenial	none	0.5	

Commodity	Established Tolerance, ppm	Reassessed Tolerance, ppm	Comments [*Correct Commodity Definition*]
Sorghum, stover	none	1	
Sorghum, forage	none	0.5	
Sorghum, grain	none	0.08	
Sugarcane	none	0.08	
Wheat, forage	none	0.5	
Wheat, grain	none	0.08	
Wheat, straw	none	1.0	
Tolerances Needed Under 40 CFR §180.220(a)(2)[3]			
Sugarcane molasses	none	tbd [2]	additional data are required to determine the need for a separate tolerance
Wheat, hay	none	1.5	HED proposes this tolerance based on residue data for wheat forage, taking into account concentration of residues as forage is dried to hay. Alternatively, the registrant may provide residue data on wheat hay from field trials.
Tolerances to be Proposed Under 40 CFR §180.220(d)			
[Indirect residues infoliage of legume vegetables]	none	tbd	additional data are required to determine the need for indirect residue tolerance(s)

[1] Tolerances reassessed based on combined residues of atrazine, G30033, G-28279, and G-28273.

[2] tbd = To be determined. Reassessment of tolerance(s) cannot be made at this time because additional data are required.

[3] Tolerances based on combined residues of 2-hydroxy-4-ethylamino-6-isopropylamino-s-triazine (G-34048), 2-amino-4-hydroxy-6-isopropylamino-s-triazine (GS-17794), 2-amino-4-hydroxy-6-ethylamino-s-triazine (GS-17792), and 2,4-diamino-6-hydroxy-s-triazine (GS-17791).

CODEX HARMONIZATION

Codex MRLs are not proposed or established for residues of atrazine in/on agricultural commodities. Therefore, there are no issues regarding harmonization of U.S. tolerances with Codex MRLs.

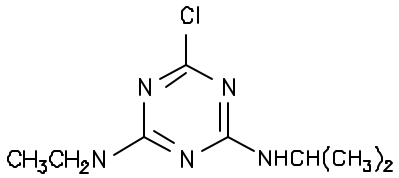
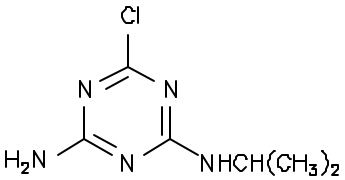
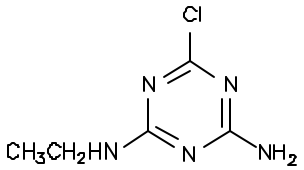
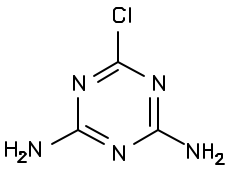
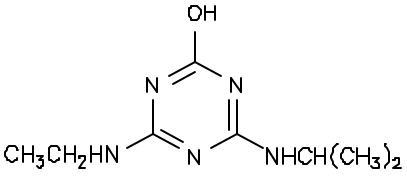
DIETARY EXPOSURE ASSESSMENT

For the purposes of dietary risk assessment, atrazine and its three chlorinated metabolites: 2-amino-4-chloro-6-isopropylamino-s-triazine, 2-amino-4-chloro-6-ethylamino-s-triazine, and 2, 4-diamino-6-chloro-s-triazine, will be included in the acute and chronic dietary exposure assessments. Dietary exposures to combined residues of atrazine and the chloro-metabolites will be compared to the appropriate acute and chronic RfDs for atrazine. A separate dietary assessment on the combined residues from the four hydroxy metabolites of atrazine will also be performed and compared to the chronic RfD specific for hydroxy atrazine (2-hydroxy-4-ethylamino-6-isopropylamino-s-triazine).

Dietary exposure for atrazine residues in plant commodities will be based on a variety of data from field trials, USDA's Pesticide Data Program (PDP), and metabolism studies. Estimates of dietary exposure are expected to be conservative, because with the exception of wheat grain, most samples of plant commodities used for human consumption collected from field trials or analyzed under the PDP had non-detectable residues of atrazine, the chloro-metabolites and hydroxy atrazine compounds. In these cases, metabolism study data were used to estimate the potential residues present in plant commodities. Residues in meat and milk could be estimated from animal feeding studies.

Although there are tolerances for range grasses, residues on range grasses were not included in the dietary assessment for meat and milk, as these uses are limited to 3.5 million acres under the Conservation Reserve Program (CRP) in OK, OR, NE, and TX. Atrazine is applied to these lands to clear away other grasses and allow the selected native grass to become established. As a result, applications of atrazine occur prior to planting the native grasses. Under this use, it is prohibited to use these lands for grazing and to cut the grasses for hay, except in national emergencies. Atrazine residues are expected to be insignificant by the time any native grass would be harvested for feed as in the case of a national emergency. Further, atrazine is used on at least 70% of the U.S. corn crop, which is estimated at 70 million acres annually. Since corn grain and forage are significant livestock feed items and are fed preferentially to beef cattle for fattening before slaughter, it is expected that atrazine residues in corn forage and grain impact the livestock diet to a greater degree than range grasses grown on CRP lands. Because of the limited acreage, timing of application, restrictions on the use of these range grasses for animal feeds, and the dominance of corn as a feed item, range grasses are not expected to impact either the livestock diet or the risk estimates significantly, and consequently were not included in the dietary exposure assessments.

Figure A. Chemical structure and names of atrazine and its metabolites.

Common/Chemical Name (Code)	Chemical Structure
Atrazine 2-chloro-4-ethylamino-6-isopropylamino-*s*-triazine (G-30027)	
2-amino-4-chloro-6-isopropylamino-*s*-triazine (G-30033)	
2-amino-4-chloro-6-ethylamino-*s*-triazine (G-28279)	
2,4-diamino-6-chloro-*s*-triazine (G-28273)	
Hydroxyatrazine 2-hydroxy-4-ethylamino-6-isopropylamino-*s*-triazine (G-34048)	

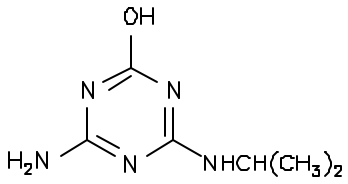
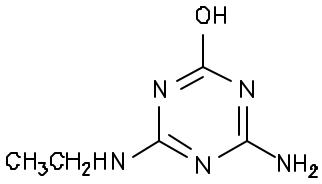
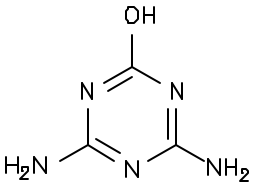
Common/Chemical Name (Code)	Chemical Structure
2-amino-4-hydroxy-6-isopropylamino-*s*-triazine (GS-17794)	
2-amino-4-hydroxy-6-ethylamino-*s*-triazine (GS-17792)	
Ammeline 2,4-Diamino-6-hydroxy-*s*-triazine (GS-17791)	

Table A. Atrazine Use Patterns Relevant to Reregistration

Site Application Type [a] Application Timing Application Equipment	Formulation [EPA Reg. No.]	Max. Single Application Rate (lb ai/A)	Max. # Apps./season	Minimum Retreatment Interval (Days)	Use Limitations [b c]
Corn					
Broadcast or banded Early Preplant; preplant surface or incorporated, preemergence, or postemergence to corn #12" tall Ground or aerial applications	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497] Others [d]	1.6-2	NS (Not specified)	NS	A 21-day PGI or PHI for forage is in effect. The label specifies a maximum rate of 2.5 lb ai/A/season. For preplant surface treatments, use on medium or fine-textured soils with reduced tillage systems only in CO, IA, IL, IN, KS, KY, MN, MO, MT, ND, NE, SD, WI and WY, up to 45 days preplanting; on coarse textured soils, do not apply >2 weeks prior to planting.
Broadcast Fallow weed control (and continued control in following minimum tillage corn). Applied to stubble ground after wheat harvest in a wheat-corn-fallow crop rotation. Ground or aerial applications	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497]	3 1.5 (ND & SD soils with pH>7.5) 2.0 (ND & SD soils with pH<7.5)	1	NS	Use limited to CO, KS, ND, NE, SD, and WY. Wheat-corn-fallow cropping sequence must be followed. Do not apply following corn harvest. An 18-month plant-back restriction is specified for all crops other than those on the label. Grazing or feeding of forage from treated areas are prohibited.
Broadcast Winter weed control in TX Ground or aerial applications	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497]	0.8-1.0	NS	N/A	For postemergence control of winter weeds only on fall bedded land in the Gulf Coast and Blacklands of TX. Normal weed control programs may be used in the following corn, grain sorghum, or sorghum forage crops the following spring. The label prohibits planting any crops except corn, grain sorghum, or forage sorghum in the spring following this treatment.
Guava					
Broadcast Ground application	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497]	4.0	3	120	Use only on established guava at least 18 months old. Label states, "do not apply more frequntly than at 4-month intervals".

(Continued; footnotes follow)

Site Application Type [a] Application Timing Application Equipment	Formulation [EPA Reg. No.]	Max. Single Application Rate (lb ai/A)	Max. # Apps./season	Minimum Retreatment Interval (Days)	Use Limitations [b c]
Grain Sorghum or Sorghum-sudan hybrids (grain and forage types)					
Broadcast or banded Early Preplant; preplant surface or incorporated, preemergence, or postemergence to sorghum #12" tall Ground or aerial applications	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497] Others [d]	1.6-2	NS	NS	A 21-day PGI or PHI for forage is in effect. The label specifies a maximum rate of 2.5 lb ai/A/season. For preplant surface treatments, use on medium or fine-textured soils with reduced tillage systems only in CO, IA, IL, IN, KS, KY, MN, MO, MT, ND, NE, SD, WI and WY, up to 45 days preplanting; on coarse textured soils, do not apply >2 weeks prior to planting. Do not apply preplant surface or incorporated in AL, AR, FL, GA, LA, MS, NC, NM, OK, SC, TN, or TX. Do not apply preemergence in NM, OK, or TX, except in northeast OK, the TX Gulf Coast and Blacklands areas. Other minor uses are noted below. [e]
Broadcast Winter weed control in TX Ground or aerial applications	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497]	0.8-1.0	NS	NA	For postemergence control of winter weeds only on fall bedded land in the Gulf Coast and Blacklands of TX. Normal weed control programs may be used in the following corn, grain sorghum, or sorghum forage crops the following spring. The label prohibits planting any crops except corn, grain sorghum, or forage sorghum in the spring following this treatment.
Broadcast Fallow weed control (and continued control in minimum tillage sorghum) applied to stubble ground following wheat harvest in a wheat-sorghum-fallow crop rotation. Ground or aerial applications	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497]	3	1	NA	Wheat-sorghum-fallow cropping sequence must be followed. Do not apply following sorghum harvest. An 18-month plant-back restriction is specified for all crops other than those on the label. Grazing or feeding of forage from treated areas are prohibited.

(Continued; footnotes follow)

Site Application Type [a] Application Timing Application Equipment	Formulation [EPA Reg. No.]	Max. Single Application Rate (lb ai/A)	Max. # Apps./season	Minimum Retreatment Interval (Days)	Use Limitations [b c]
Macadamia nuts					
Broadcast Ground application	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497]	4.0	NS	NS	
Sugarcane					
Broadcast or banded Preemergence (at-planting or ratooning) followed by one application at emergence, and up to two interline post-emergence directed applications prior to close-in (lay-by). Ground or aerial application	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497]	2-4	4	NS	Treatments may be made applied in a minimum of 20 gal/A of water by ground and 5 gal/A of water by air. A reasonable interval between lay-by and harvest would be 120-150 days, providing a built-in PHI. A maximum of 10 lb ai/A may be applied to each sugarcane crop. In FL and TX, 0.5-1 gal of surfactant/100 gal of spray may be used. In LA, an application of 2 lb ai/A may be used to control annual weeds during summer fallow period; after-planting applications may not exceed 8 lb ai/A.
Fallow Wheat Stubble (Wheat is not a target crop)					
Broadcast Fallow weed control applied to stubble ground following wheat harvest in a wheat-fallow-wheat crop rotation. Ground or aerial applications	90% DF [100-585] [100-756] 4 lb/gal FlC [100-497]	0.5-1	1	NA	Use limited to CO, KS, ND, NE, SD, and WY. Grazing of treated areas is prohibited for 6 months, and a 12-month plant-back interval for wheat is specified.

AGENCY MEMORANDA CITED IN THIS DOCUMENT

CBRS No. 5783
DP Barcode: None
Subject: Atrazine Special Review. Metabolism, Revised Anticipated Residues
From: M. Metzger
To: J. Andreasen
Dated: 5/3/90
MRID(s): 41209801 through -08

CBRS No. 6796, 6797
DP Barcode: None
Subject: Atrazine Special Review. Analytical Methods and Storage Stability Data
From: M. Metzger
To: J. Andreasen
Dated: 7/26/90
MRID(s): 41397101 through -03, 41423401

DP Barcode: D185491
Subject: Atrazine, Reregistration and Special Review. Registrant Ciba-Geigy Submission of Overview and Data on Metabolism in Corn and Sorghum, Magnitude of the Residue in Corn, and Analytical Methods.
From: J. Abbotts
To: V. Eagle, K. Pearce, M. Beringer
Dated: 6/3/93
MRID(s): 42547115, -118 through 42547123

DP Barcode: D198106
Subject: Atrazine, Reregistration Case No. 0062 and Special Review. Field Metabolism Studies in Corn and Sorghum, Additional Data.
From: J. Abbotts
To: V. Eagle, J. Bailey, M. Beringer
Dated: 5/22/95
MRID(s): 43048501

DP Barcode: D197234
Subject: Reregistration Case No. 0062 and Special Review. Field Metabolism Study in Sugarcane, Analytical Methods, and Field Metabolism Study in Rotational Crops.
From: J. Abbotts
To: V. Eagle, J. Bailey, K. Boyle
Dated: 6/29/95

MRID(s): 43016503, 46016504, 43016505

DP Barcode: D215500
Subject: Atrazine, Reregistration Case No. 0062. Special review. Ciba-Geigy comments on the Triazine PD1; Additional Data on Metabolism in Sugarcane.
From: J. Abbotts
To: J. Bailey, K. Boyle
Dated: 7/6/95
MRID(s): 43598628

DP Barcode: D215509
Subject: Atrazine, Reregistration Case No. 0062. Special review. Ciba-Geigy comments on the Triazine PD1; Additional Data on Metabolism in Corn and Sorghum.
From: J. Abbotts
To: J. Bailey, K. Boyle
Dated: 7/6/95
MRID(s): 43598629

DP Barcode: D215518, D215514, D215513
Subject: Atrazine, Reregistration Case No. 0062. Magnitude of the Residue in Corn and Sorghum.
From: J. Abbotts
To: J. Bailey, K. Boyle
Dated: 8/1/95
MRID(s): 43598631

DP Barcode: None
Subject: Results of the HED Metabolism Committee Meeting Held on 9/18/95: Atrazine and Simazine Dietary Risk Assessment.
From: J. Abbotts
To: HED
Dated: 9/29/95
MRID(s): None

DP Barcode: None
Subject: Results of the HED Metabolism Committee Meeting Held on 10/30/95: Atrazine and Simazine Dietary Assessment.
From: J. Abbotts
To: HED
Dated: 11/29/95

MRID(s): None

DP Barcodes: D195321, D211558
Subject: Atrazine. Reregistration Case No. 0062 and Special Review. Hydroxyatrazine Metabolism in Goats
From: J. Abbotts
To: V. Eagle, J. Bailey, K. Boyle
Dated: 2/8/96
MRID(s): 42925601, 43508501

DP Barcode: None
Subject: Reregistration Case No. 0062 and Special Review. Registrant Ciba-Geigy Corporation. Guideline 171-4e, Storage Stability.
From: J. Abbotts
To: V. Eagle-Kunst, K. Boyle
Dated: 2/8/96
MRID(s): 41258601, 41258602, 41258603, 41397101

DP Barcode: D223895
Subject: Atrazine, Reregistration Case No. 0062 and Special Review. Registrant Ciba-Geigy Corporation. Residues in Cow Milk
From: J. Abbotts
To: K. Boyle, J. Bailey
Dated: 5/14/96
MRID(s): 43934401

DP Barcode: D239253. D248091
Subject: Magnitude of the Residue
From: Dave Soderberg
To: C. Eiden
Dated: xx/xx/00
MRID(s): 43160501, 43160502, 43160503, 43160504, 43160505, 43395502, 43395503, 43395504, 44152119, 44152120, 44152121, 44315408, 44315409, 44315410, 44315011, 4431501244597602, 44597603

MASTER RECORD IDENTIFICATION NUMBERS

The citations for the MRID documents used in this review are presented below.

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